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ABSTRACT

This compendium of current and recent innovative methods of health care delivery focuses on telemedicine, and educational and energy management and control applications. Each application is documented in a project abstract describing the system and the technology employed, and citing relevant information sources and a personal or organizational contact. Telemedicine projects described include primary health care delivery in rural northwestern Ontario, rural health care delivery, emergency medical alert systems, Massachusetts General Hospital Television Program, slow-scan television in a rural environment, telephone counseling, teleradiology, and digital imaging. Educational applications discussed include the South Carolina Health Communications Network, THE SOURCE--Home Medical Guide, Intrastate Health Communication Network (Vermont and New Hampshire), Maine Health Communications Network, Army Health Service Network, Veterans Administration and public health service biomedical experiments utilizing the communications technology satellites, Cleveland Metropolitan Area Health Education Network, statewide education programs in Maine and Georgia, health education utilizing cable television, national health care satellite networks, hospital television networks, health information networks, telephone health information systems, interactive patient education and hospital patient education programs. Finally, energy management and control projects focus on energy management through microprocessor controls and energy management control systems. An extensive bibliography is appended. (LMM)

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FINAL REPORT

**POTENTIAL APPLICATIONS AND IMPACT OF MICROELECTRONIC AND
TELECOMMUNICATION TECHNOLOGY IN HEALTH CARE DELIVERY**

October 31, 1982

Contract No. HRA 232-82-0009

SUBMITTED TO:

Health Resources and Services Administration
Bureau of Health Maintenance Organizations and Resource Development
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Division of Energy Policy and Programs

SUBMITTED BY:

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FOREWORD

If the next decade is marked, as many fear it will be, by energy shortfalls and substantial price increases, innovative methods of health care delivery may be needed in order to assure undiminished access to the health care system, particularly by those who are disabled or remotely located.

This document is a compendium of such innovative methods, as they are currently being applied or have been recently applied in the past. Three broad sets of applications are reported: Telemedicine, Educational Applications, and Energy Management and Control. Each application is documented in the form of a one- or two-page project abstract, describing the system and the technology employed, and citing relevant primary or secondary sources of information and either a personal or organizational contact. An annotated bibliography, which lists these references as well as others of general interest, is included.

The research which led to the project abstracts and annotated bibliography, as well as the development of those materials, was conducted by Michael Ney, Senior Analyst, of Mandex, Inc. Other sections of the report were developed by Leonard Greenberg, Vice President of Mandex, who served as Project Executive for this effort. Additional contractual support was provided by Donald M. Vickery, M.D.

The project was supported by a four-month contract with the Division of Energy Policy and Programs of the Office of Health Facilities in the Health Resources and Services Administration. Overall project guidance and direction was provided by Gordon W. Berg and Rhonda Greenberg.

SPECIAL NOTE

Following completion of this project, several additional applications of telecommunications to health care delivery, available through the Veterans Administration Exchange of Medical Information Program, were brought to the attention of the study team by Mr. Robert B. Shamaskin.¹ In the interest of completeness -- and, as a side benefit, to illustrate the types of applications addressed in this report -- the information reported by Mr. Shamaskin is repeated below:

South Dakota Medical Information Exchange

Through a grant from the Veterans Administration, the University of South Dakota School of Medicine has implemented an extensive audio teleconferencing network throughout South Dakota. It connects fifteen major medical facilities which are able to share programming from any location. In addition, as many as twenty conventional telephone lines can be connected to the network thus involving participants in even the smallest communities, as well as connecting prominent resources from outside the state for exchanging medical information, diagnostic and administrative activities. This is accomplished through telelecturing, consultation, and administrative conferencing, all involving interaction between presenters and receivers.

Remote Machine Assisted Treatment and Evaluation of Patients with Speech, Language and Hearing Impairments (REMATE)

This is a nationwide computer-based outreach health care delivery system which makes rehabilitative services available to patients with speech and/or hearing impairments. Through adaptation of the telephone to a computer, the patient receives therapy while remaining at home. The computer also evaluates and stores the patient's progress so the clinician is able to access the information with reference to several patients at one time and then reprogram the computer accordingly. This activity, while saving millions of dollars annually, alleviates the shortage of clinicians in remote areas and brings therapy to thousands of individuals who would otherwise receive none.

Remote Application of Computerized Axial Tomography

This activity splits the CAT scanner so that the portion which views the patient is mobile and can go to remote locations. It scans the patients, following which the computerized data which the scanner "sees" is transmitted via cable, satellite, microwave, or other means to a medical center where a consulting radiologist is able to read and interpret the data. The mobile scanner obviates the necessity of patients' traveling to obtain this diagnostic technique, while at the same time providing the technique at locations for which the cost of purchasing a full CAT scanner would be prohibitive.

¹ Special Assistant to the Assistant Chief Medical Director for Academic Affairs, Department of Medicine and Surgery, Veterans Administration, Washington, D. C.

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INTRODUCTION

Recent stunning advances in microelectronic and telecommunication technology have brought about equally stunning applications in many areas. The field of health care delivery is no exception. Telecommunications has been used, for example, to bring health care to patient populations whose access to the health care delivery system would otherwise be limited; it has been used to promote the exchange of information between primary care providers and specialists at remote facilities; it has been used to broadcast educational and training programs to audiences previously unreachable. Microelectronics, principally the use of microcomputers, has given rise to whole sets of applications -- in energy control and management, in records keeping, etc. -- not previously economically achievable.

The impact of these applications has been tangible. Their direct impact can be measured, in many cases, in terms of explicit cost savings and/or increased access to health care. Many applications, however, have had a further impact -- direct or indirect -- upon energy conservation as well. Reductions in lengthy trips by physicians or patients, made possible through the use of telecommunications, save fuel as well as time. Reductions in underutilized staff at remote locations have a comparable energy impact, albeit indirect. Other, direct energy savings result from the use of modern technology explicitly for purposes of energy control and management.

Some of these applications are well-known, well documented, and a recognized part of the state-of-the-art. Others, however, may be too current and/or as yet too sparsely documented to have reached a significant component of the health care community. The purpose of this document is to report on the latter set of applications and to discuss their potential impact on the health care delivery system for the next decade.

Scope

As indicated, applications which are widely known and considered to be state-of-the-art have been generally excluded. For example, a widely distributed document by the National Center for Health Services Research (NCHSR) previously reported over 150 grants and contracts (through 1978) designed to:

"improve the delivery of health care both in inpatient and out-patient settings through the application of computer technology and information science...The research has been directed toward serving the needs of the health care administrator whose responsibility is facility management and the provider of care whose responsibility is clinical management."¹

Documentation of this sort is included in the bibliography but not otherwise discussed. In particular, several key microelectronic applications have been deliberately omitted from this report; examples of these exclusions are computer-assisted electrocardiography, automated patient monitoring systems, and hospital information systems, all of which have an ample literature of their own. Rather, the report focuses on two broad areas of energy-related application: (a) telemedicine, in which telecommunications and microelectronics combine to overcome distance as an inhibiting factor in the delivery of health care, and (b) educational applications, in which modern technology serves to extend the education, understanding, and awareness of all who participate in the health care delivery system, provider and consumer alike.

A third, relatively brief section covers applications involving energy management and control. Each section consists of an introductory discussion, followed by detailed abstracts covering each relevant application and providing references and contact names as appropriate.

¹ _____, "Computer Applications in Health Care," U.S. Department of Health and Human Services, NCHSR Report Series, DHHS Publication No. (PHS) 80-3251, June 1980.

Background

Less than ten years have passed since the OPEC nations imposed an embargo on petroleum shipments to the United States. This action and its effects put into focus a problem which had been clear to many: an ever-increasing shortfall in the domestic supply of petroleum and natural gas.

The embargo and its effects on the American economy cannot be overstated. The escalating energy-related costs adversely impacted upon individuals and institutions alike. The embargo, however, did serve to trigger a series of national responses designed to achieve national energy independence, primarily through development of alternative fuel sources and energy management and conservation.

One such active organizational response was the creation in 1975 of the Division of Energy Policy and Programs within the Bureau of Health Facilities, Health Resources Administration, Department of Health and Human Services. The Division is the sole entity within the Federal establishment to insure that health planners and policy-makers consider energy implications in their decision making process and that energy planners and policy-makers consider the unique needs and constraints of the health industry.¹

The health care industry, "one of the most energy-intensive enterprises in the United States",² is particularly susceptible to the depleting energy supplies and spiraling costs. A series of studies performed in 1978 (American Institute of Architects Research Corporation, Chicago Hospital Council, Fritz R. S. Dressler Company, Peekskill Community Hospital, and the Division of

¹ _____, "Energy Issues In Health," U.S. Department of Health, Education, and Welfare, DHEW Publication No. (HRA) 79-14510.

² _____, "Energy Strategies for Health Care Institutions," U.S. Department of Health, Education, and Welfare, DHEW Publication (HRA) 80-14515, October 1979.

Energy Policy and Programs) revealed that approximately 2 1/2 percent of all energy used in the United States is used within hospitals and that 50 percent of this usage was related to climate control within the facility. Additional data revealed that energy costs in 1972-3 may have represented one percent or less of a hospital's budget; this figure has since risen to approximately seven percent by 1978.¹ The rise occurred in spite of attempts to conserve energy in light of escalating prices.

Energy impacts have a tendency to be analyzed in the context of those systems which consume energy directly, i.e., heating, ventilation, cooling, humidification and dehumidification, lighting, food cooking, etc. A systemic approach (total energy management) suggests that the interrelationships of the various systems be quantified. As such, an understanding of the potential influence of human systems, i.e., those persons who have an impact on when and in what quantity energy is consumed (health care personnel, volunteers, patients, and visitors), is fundamental.²

Examples of human system energy impacts include: patients who need to visit a physician or receive treatment yet cannot because of fuel constraints, and health care providers who cannot see patients in different locations because of reduced fuel supply. The potential impact is widespread and touches all levels of society. No segments are protected from its ill-effects although some may be better insulated than others. Regardless, informed program managers and planners must continue to utilize emerging technology. It is in this spirit and for this purpose that this report is prepared.

¹ Ibid, pp. 41-49.

² _____, "Total Energy Management For Hospitals," U.S. Department of Health, Education, and Welfare, DHEW Publication No. (HRA) 80-14516.

Potential Impact Over the Next Decade

Despite their promise and occasional glamor, not all applications of telecommunication and microelectronic technology to health care delivery are necessarily cost-beneficial. To cite one example, an earlier two-way television hookup between Massachusetts General Hospital and Boston's Logan Airport, installed as a demonstration, has since been discontinued; although no explicit evaluation results are as yet publicly available, the results were presumably meager.

As energy costs continue to climb, however, the demarcation between what is cost-beneficial and what is not is subject to change. Patients who thought nothing of traveling 50 to 100 miles for health care in the 1970's will think twice about making such a trip when fuel is scarce or prohibitively priced. Telemedicine, in one or more of its forms, may be the answer.

At this juncture, it may reasonably be concluded that telecommunications and/or microelectronics provide a potential for energy savings over and above whatever other benefits (e.g., increased access to health care, improvements in health status, etc.) might be expected to accrue. It is the energy benefits which are the most volatile, i.e., which are the most likely to increase over time. It is these benefits, therefore, which are the most likely -- as they increase -- to convert an application which is currently of marginal utility into one whose cost-effectiveness is unquestioned.

The energy-related savings made possible through the use of telecommunications and/or electronics fit several possible scenarios. Telecommunications has been used, as we shall shortly see, to provide a medical alert capability for individuals in need of emergency assistance; more importantly, it has been used to support the provision of direct patient care by facilitating information flow between physician and patient as well as between primary care provider and

specialist. Each of these applications has a potential energy-related impact, highly dependent upon the local setting. In some settings, the impact may be small; in others, there may be no positive impact at all. To illustrate the types of impacts involved, two hypothetical applications and their associated energy savings are discussed below:¹

Illustrative Application A (Medical Alert System)

Impact No. 1: Within a given community, N home-ridden patients are spared an average of X unnecessary visits per year through use of a medical alert system which permits them to summon help when it is needed rather than being obliged to seek care preemptively. The average savings per trip is G gallons of fuel at C dollars per gallon.

Average annual savings: $NXGC$

Impact No. 2: As a result of their increased access to needed health care, the N home-ridden patients enjoy an improved health status which saves them, in the long run, an average of Y medical visits per year. Again, the average savings per trip is G gallons of fuel at C dollars per gallon.

Average annual savings: $NYGC$

The savings associated with Impacts 1 and 2 combined is $N(X+Y)GC$. Whether this amount is significant or not depends on the magnitude of each of the parameters involved. While some reduction in medical visits -- parameters X and Y -- may be expected as the result of a medical alert system, there are no reliable data on the extent of the reduction nor any assurance there will be a reduction at all. The point to be noted, however, is this: so long as there is any reduction whatsoever (i.e., so long as X and Y are positive), if the number of patients (N), the number of gallons per trip (G), or the cost per gallon (C) is sufficiently large, the resulting energy savings may well be substantial.

¹ Since the focus of this document is energy, the impacts illustrated in this discussion deal solely with fuel and other energy savings. Other, non-energy benefits -- e.g., reduced cost of care, improved health status, etc. -- might also be expected.

The process by which these savings are calculated is illustrated, hypothetically, below:

Example: A medical alert system is made available to 10,000 individuals ($N = 10,000$) in a large retirement community. Of this group, 3,000 are saved two unnecessary trips per year, 2,000 are saved one trip per year, 2,500 are obliged to expend one additional visit per year (as a result, perhaps, of undue reliance upon episodic as opposed to preventive care), and in 2,500 cases there is no change whatsoever in visit frequency. The average trip for medical care consumes three-quarters of a gallon of gas ($G = 0.75$) and the price per gallon is \$1.30.

Impact No. 1 is calculated as follows:

$$N = 10,000$$

$$X = \frac{[3000 \times 2] + [2000 \times 1] + [2500 \times (-1)]}{10,000} = 0.55$$

$$G = 0.75$$

$$C = \$1.30$$

$$NXGC = \$5,362.50 \text{ (per year)}$$

To this will be added Impact No. 2, similarly calculated. While it is doubtful that the sum of these impacts, alone, would result in the system's "paying for itself," they nonetheless provide an important contribution to the "benefit" side of the system cost-benefit equation.¹

Illustrative Application B (Direct Patient Care)

Impact No. 3: A minimally staffed satellite clinic, connected through telecommunications to a larger central facility, handles the medical needs of a given community with the aid of M less personnel than might otherwise be required. Each staff person averages 225 workdays per year and expends, on each trip to and from work, G gallons of fuel at C cents per gallon.

Average annual savings: 225MGC

(NOTE: The value of G in this example is not necessarily the same as in Application A. Here, G pertains to staff, rather than patient, travel.)

¹ Another potential benefit of a medical alert system is its ability to serve as an alternative to institutionalization. This feature, too, presents the possibility of energy savings.

Impact No. 4: Use of reduced staff saves S square feet of space at an average annual energy cost of D dollars per square foot.

Average annual savings: SD

Again, the magnitude of Impacts 3 and 4 combined may fail to exceed the overall system cost or may, in some cases, be non-existent. However, if fuel costs (C) and structural energy costs (D) continue to climb, applications previously rejected as cost-ineffective may well warrant a second look.

Example: The use of telecommunications permits a satellite clinic to serve the medical needs of a remotely located community with two less nurses, one less technician, and 5,000 less square feet than might otherwise be required. There is also a savings of a half-time physician (i.e., who would otherwise travel to the facility every other day). The average trip to and from work consumes three gallons of gas at a cost of \$1.30 per gallon. The marginal cost of energy, primarily for purposes of heating, ventilation, and air conditioning, is \$6.00 per square foot per year.

Impacts No. 3 and 4 are then calculated as follows:

M = 3.5 (two nurses, one technician, and a half-time physician)
 G = 3.0 (i.e., three gallons per trip)
 C = \$1.30
 Impact No. 3 = 225 MGC = \$3,071.25/year

S = 5,000 sq. ft.
 D = \$6.00
 Impact No. 4 = SD = \$30,000/year

The value of \$6.00 per square foot of marginal energy cost, assumed in the preceding example, is based on figures contained in the Division of Energy Policy and Programs' publication "Energy Issues in Health," DHEW Publication No. (HRA) 79-14510, published in August 1979. The relevant numbers are as follows:

- (1) The climate control requirements of U.S. hospitals range between 85,000 BTU/sq.ft./yr. to over 700,000 BTU/sq.ft./yr. (op. cit., p.42).
- (2) Energy costs, in 1977, were approximately \$3.12 per million BTUs (op. cit., p. 46).
- (3) A hospital with average climate control requirements -- on the order of 350,000 BTU/sq.ft./yr. -- thus expended, in 1977, about \$1.09 per square foot [i.e., $\$3.12 \times 0.35$].

- (4) Since "over 50 percent of a hospital's energy usage is related to climate control" (op. cit., p. 42), the total energy cost for the hospital in question was somewhere about \$2.00 per square foot -- again in 1977 dollars.
- (5) The approximate three-fold increase in unit fuel prices since 1977 (Source: U. S. Department of Energy, Monthly Petroleum Product Price Report) raises the hospital's energy cost per square foot to approximately \$6.00, the value assigned in the example.

Apart from the care-related applications described above, telecommunications and microelectronics offer new ways of expanding the educational horizons of both health care providers and consumers (Section B of this report). Teleconferencing among providers, for example, clearly saves travel cost; the magnitude of the savings depends upon the number of individuals involved, the saved trip length (in gallons of fuel) and the cost per gallon. Educational applications aimed at the consumer present energy savings as well; these savings are measured by the number of medical visits per year saved as a result of the improved health status which presumably results from increased consumer awareness. A recent study (not yet published) by the Center for Consumer Health Education in Reston, Virginia, has disclosed significant reductions in visit frequency by health plan members who were provided relevant educational materials as opposed to members of a control group who were not. Significant improvements in both health-related life style and perceived timeliness of visits were also noted. Although the impact of these changes upon overall health status remains to be demonstrated, some degree of energy savings may reasonably be inferred.

A. TELEMEDICINE

TELEMEDICINE

The concept of telemedicine has come to describe the broad use of telecommunication technology to transmit voice, data, and images among health care providers, as well as between patients and providers, in dispersed locations. In the early 1960's, telemedicine became a term used synonymously with the practice of medicine through the use of television; however, a telemedicine system in its simplest form need only consist of two locations exchanging information via telephone. Applications are not limited to the linkage of remote locations, as is commonly perceived, but involve the linkage of any location removed from the primary reception source. Secondly, where early applications may have aimed at extending the "eyes and ears" of the physician through the use of television, applications now range from simple telephone transmission to sophisticated satellite-based telecommunication linkages supported by microelectronic enhancements.

A number of positive impacts are experienced through the application of telemedicine concepts. First, timely health care received by an individual at a dispersed location, to whom such care might otherwise be unavailable, might be expected to result in: (1) improved health status, (2) the need for fewer referrals, (3) less severe bouts of illness, and (4) a reduction in future physician visits and episodes requiring hospitalization. Secondly, energy savings accrue through the associated reduction in travel, with additional savings resulting from increased productivity and (possibly) reduced child care expenses.

The telemedicine applications described in this section range from medical alert systems (in which patients in need of care can trigger an emergency response from a remote location) to systems which use telecommunications to

support the direct provision of patient care. Additional applications may be found in a 1978 MITRE Corporation report on Telehealth.¹

Medical Alert Systems. - Recent use of the medical alert concept has meant, for example, that elderly persons, who in the past may have required institutional support (inpatient, nursing home) can remain in their homes, resulting in a reduction in health care costs, as well as other benefits.

Lifeline and Link to Life, two such systems, recently demonstrated on a large scale basis the feasibility of the use of the telephone as a vehicle for summoning emergency medical assistance. These systems operate under an identical concept -- being able to summon emergency assistance from the local hospital through the individual's home telephone. The home unit is activated via a portable transmitter carried by the individual. Combined, these systems report over 600 facilities with operational programs.

Direct Patient Care. - Examples of systems which have in the recent past supported the provision of patient care include: (1) STARPAHC, a ground-based system in southern Arizona on the Papago Indian Reservation; (2) Sioux Look-out, a rural health zone in the Province of Ontario, Canada; and (3) a series of rural, isolated demonstrations conducted under the aegis of the Bureau of Community Health Services (BCHS).

These applications demonstrate the use of slow-scan television to transmit still images over telephone lines. The STARPAHC and BCHS applications transmit in color as well as black and white; STARPAHC is further distinguished by its use of a mobile clinic that provides general outpatient services to isolated populations on the reservation.

¹ Bennett, A.M. et al., "Telehealth Handbook: A Guide to Telecommunications Technology for Rural Health Care," MITRE Corporation, U.S. Department of Health, Education, and Welfare Publication (PHS)79-3210, May 1978.

In its simplest configuration, direct provider-to-patient telephone counseling to hypertensive patients was found, in a Baltimore clinic, to be: (1) as effective as face-to-face counseling; and (2) about twice as cost-effective as clinic counseling.

Another example of a multifaceted telemedicine application is the Massachusetts General Hospital (Boston, MA) experience. The Massachusetts General Hospital (MGH) telemedicine program, directed by Dr. Kenneth Bird, has been active in some form for 14 years; it began in 1968 under a grant from the United States Public Health Service. The initial telemedicine application involved using a two-way microwave television hookup between the hospital and Logan Airport Medical Station located approximately two miles away. The Logan Station was staffed by a nurse on a 24-hour basis. Physicians were on duty during peak hours during the day. The two-way link allowed MGH to view a patient whenever the physician or the nurse determined it was medically necessary. While the MGH-Logan program was operational, physicians utilized the link to transmit x-rays, study blood smears, and transmit electronic heartbeats.

The MGH-Logan demonstration led to a similar experimental hookup between MGH and the Veterans Administration Hospital in Bedford, MA; this program was followed by a two-way hookup with a nursing home located approximately 10 miles from the hospital. A continuation of the nursing home experiment is currently under consideration by MGH.

Included in this section are several applications involving the use of teleradiology. Teleradiology, the transmission of x-ray images from remote geographic sites via telephone lines or other electronic means, can be characterized as a distinct form of telemedicine in the sense that it permits health care providers to transcend problems of distance and remote location.

As noted by MITRE, access to radiology services "may be a major problem for millions of Americans in rural areas and for members of Armed Forces and their dependents on remote military bases without sizable hospitals."¹ Traditional approaches -- i.e., the mailing of radiographs to radiologists, transport of patients, and traveling radiologists -- can result in the needless delay of diagnosis and treatment. The use of image transmission has been effectively utilized as a way of overcoming these problems, i.e., of minimizing unnecessary diagnostic and treatment delay and needless patient and radiologist travel.

Teleradiological demonstrations that seek to achieve these impacts have been implemented by the MITRE Corporation for the Bureau of Community Health Services (BCHS). These experiments were undertaken as a component of the BCHS research program designed to explore innovative approaches to health care in rural, isolated areas. Recent demonstration sites included: McKenzie River Clinic in Lane County, Oregon; Rathbun Area Health Services in Centerville, Iowa; Sturgeon Bay area of Door County, Wisconsin; and Kirksville, Missouri.²

In 1981, BCHS transferred the Rathbun Area slow-scan equipment to Kirksville, Missouri for use by the Kirksville College of Osteopathic Medicine (KCOM). KCOM operates 10 clinics in Northeast Missouri which provide primary care to the underserved rural population in that area as well as teaching

¹ Harrington, M.B. et al., "A Laboratory Evaluation of the Technical Performance of the Teleradiology System: Summer 1980," MITRE Corporation, MITRE Technical Report MTR-81W201, August 1981.

² Mowen, D.L. et al., "Rural Health Technology Demonstrations and Evaluation: An Overview and Annotated Bibliography," MITRE Corporation, MITRE Technical Report MTR-80W189, December 1980.

experience for fourth year KCOM students. Installation of the slow-scan equipment allows for one-way transmission from Labelle Rural Clinic to the central KCOM hospital in Kirksville 40 miles away.¹

Until recently, slow-scan television, which involves analog transmission over telephone lines, had been the primary means of transmitting radiographs. Evaluations concluded that, despite image quality shortcomings, slow-scan transmission was more than adequate when no alternative capability existed. The evaluation also concluded that the accuracy of teleradiology images could be improved if digital radiography technology could be incorporated into the teleradiology system. Recent technological advancements in digital image transmission, demonstrated by the Boston City and Boston University Hospital network described in this section, illustrate the potential for system development that goes beyond the use of slow-scan television.

¹ Strong, H.M., "Review of the Kirksville College of Osteopathic Medicine's Use of Slow-Scan Television for Teleradiology," MITRE Corporation, Working Paper 81W00729, December 11, 1981.

APPLICATION A-1TITLE

Primary Health Care Delivery in Rural Northwestern Ontario

TECHNOLOGY

Slow-Scan Television
Telephone

DESCRIPTION

The Sioux Lookout zone health care system covers approximately 385,000 square kilometers in the Northwestern corner of the Province of Ontario and contain approximately 10,000 Native Indians. The administrative and health care center for the zone is the Sioux Lookout Zone Hospital, a 70-bed hospital in Sioux Lookout. Most of the native population reside in 25 remote villages of 50 - 1,500 individuals.

Seven of the larger communities have well-equipped staffed nursing status. The remaining communities receive day-to-day health care from community health aides; family physicians make regular twice weekly visits to all communities.

Earlier Canadian urban telecommunications studies utilizing various modes of diagnosis (e.g., color television, black-and-white television, telephone and face-to-face consultation) revealed that there were no apparent benefits from the more expensive broad-band television system versus technologies that used telephone lines; however, it was felt these assessments did not reflect the complexity of health care delivery in remote areas. Therefore, in 1977 a two-year study commenced to investigate the costs and benefits of slow-scan video and hands-free telephone.

Eight slow-scan video systems have been installed; including three hospital units (Sioux Lookout, Sunnybrook Medical Center in Toronto and the Hospital for Sick Children in Toronto).

During the first two years of operation, the system was used more than 600 times. The most common use has been the transmission of x-ray images from the nursing stations to the zone hospital; additional educational uses include: 1-hour roentgenographic rounds for the physician at the zone hospital. At the time of this article, the project had not been completely assessed.

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Dunn, E., et al., "Telemedicine links patients in Sioux Lookout with doctors in Toronto," Can Med Assoc J, February 23, 1980, pp. 484-487.

RELATED ARTICLE

Harrison, J.L., "Telemedicine: The Ontario Project," Med Electron, October 1980, pp. 84-9.

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APPLICATION A-2TITLE

Rural Health Care Delivery

TECHNOLOGY

Microwave Television
Slow-Scan Television

DESCRIPTION

In 1972, Johnson Space Center, National Aeronautics and Space Administration (NASA) solicited applications from areas interested in becoming demonstration sites for the applications of space technology communications in the support of health care. A joint review conducted by NASA and the Department of Health and Human Services resulted in the selection of the Papago Indian Reservation in south central Arizona. The project subsequently became known as STARPAHC (Space Technology Applied to Rural Papago Advanced Health Care). This demonstration program was funded for a 24-month period; since the ending of its formal sponsorship the Papago tribe has continued program operation.

The origin of the STARPAHC concept resides in the major NASA mission of space exploration and the development of an Integrated Medical and Behavioral Laboratory Measurement System to provide routine and emergency medical services to astronauts during orbit. The STARPAHC was designed as an earthbound test with two sets of objectives: (1) development of health care systems suitable for future manned space flight; and (2) development of efficient communication systems for implementation in remote areas where access to medical care is a services problem.

Existing site facilities available to the Papago health program included: a 50-bed primary care hospital; a physician directed health center; and one Community Health Medic staffed health station without telephone service. These programs were supplemented by clinic services conducted in various locations by Public Health Nurses, Community Health Representatives, Disease Control Workers, and others. Specialty medical services were available from surrounding areas, not all of which were in close proximity to the test site.

Building upon the health care delivery system and medical personnel provided by the Indian Health Service, NASA and its contractor, Lockheed, focused on the hardware and technological components. NASA added: (1) a mobile clinic equipped with telecommunications apparatus; (2) two-way television transmission and reception capability among selected sites; (3) a minicomputer at the hospital; (4) slow-scan television transmission between the hospital and Phoenix; and (5) system support equipment (e.g., consoles, power systems).

Numerous evaluations were conducted and reported in the article relating to equipment performance, patient accessibility, patient acceptability, quality of care, and STARPAHC subsystems and component performance. For example, evaluation of the mobile clinic revealed a savings in patient travel alone of 322,672 miles. Most importantly, it was concluded that the "use of mobile general clinics in certain circumstances can provide comprehensive health at a cost competitive with other alternative means of achieving the same degree of accessibility to health services."

REFERENCES

Justice, J.W., Decker, P.G., "Telemedicine in a Rural Health Delivery System," Advances in Biomedical Engineering, Volume 7, 1979, pp. 101-171.

Bashur, R., "Technology Serves the People," Indian Health Service, Office of Research and Development, 1979.

Fuchs, M., "Provider Attitudes Toward STARPAHC: A Telemedicine Project at the Papago Reservation," Med Care, January 1979, pp. 59-68.

CONTACT

Not Available

APPLICATION A-3TITLE

Emergency Medical Alert Systems

TECHNOLOGY

Telephone

DESCRIPTION

Lifeline, a system that provides a direct link between a person carrying a small emergency transmitter which clips to clothing and a hospital emergency room, is being implemented at the Loudoun Memorial Hospital in Leesburg, Virginia. If there is an emergency, the person presses the button on the transmitter which automatically dials the emergency response center which in turn initiates a series of predetermined emergency responses. An additional system feature insures that the Lifeline unit will automatically signal the hospital for help if you fail to reset the timer on the home unit.

It is reported that 375 facilities around the country have installed the Lifeline system. The system was designed by Professor Andrew S. Dibner of Boston University and studied and tested within the frail elderly population by the U.S. Department of Health and Human Services. The study was conducted by Dr. Sylvia Sherwood at the Department of Social Gerontological Research at the Hebrew Rehabilitation Center for Aged in Boston.

The study, as reported by Lifeline Systems, involved 200 system users and a "carefully selected control group." Findings included: that Lifeline users "average only one day of nursing home care compared to 13 days for the controls ...and the largest group of participants (severely functionally disabled and not socially isolated)." Each \$1.00 of Lifeline services produced a net savings of \$7.19 in total long-term care costs due to reduced use of institutional and community services.

A survey conducted by Lifeline found that of the 2,000 clients on line (72 programs responded to the survey) in approximately 350 cases being on Lifeline kept the individual out of a nursing home; and in 200 cases a hospital stay was reduced because the person could have Lifeline as an alternative.

A system that operates on a similar principal, Link to Life, is being implemented in Commonwealth Hospital (Fairfax, VA). Equipment includes a portable transmitter which can emit an emergency signal from as far as 300 feet; this signal, as in Lifeline, activates a unit that is hooked to the telephone.

REFERENCES

Martz, M., "New System Provides Link to Hospital," Loudoun Times-Mirror, July 29, 1982.

Stewart, S.A., "Link to Life - New System Will Speed Aid to Elderly Stricken at Home," The Fairfax Journal, August 20, 1982.

Galton, L., "When Life is at Your Fingertips," Parade, August 22, 1982.

Mushinsky, R.O., "Medical Alert System Links High-Risk Homebound to Wallingford Home," NewsScene (American Association of Homes for the Aging), (reprint) April 1982, pp. 5-9.

CONTACT

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APPLICATION A-4TITLE

Massachusetts General Hospital Telemedicine Program

TECHNOLOGY

Microwave Television

DESCRIPTION

In 1968, under a grant from the U.S. Public Health Service, Massachusetts General Hospital (Boston, MA) began a series of three telemedicine programs utilizing two-way television transmission.

The first program involved a link between Massachusetts General (MGH) and the medical station at Boston's Logan Airport. This hookup enabled physicians at MGH to respond to medical problems at the airport's medical station. The airport station was staffed with nurses on a 24-hour basis; physicians were on duty during peak hours. By having health professionals available around the clock at the airport station, physicians at MGH were able to respond to medical emergencies at any time.

The Logan experiment led to a series of future demonstration applications. For example, a microwave system was constructed that linked Bedford Veterans Administration Hospital and MGH. The system focused on providing counseling and psychiatric services from MGH to Bedford. This link was also utilized to transmit an educational course from MGH to Bedford; this course was designed to help prepare VA psychiatrists for their board examinations in psychiatry.

A second program involved transmission from a nursing home, located approximately 10 miles away, to MGH. Unlike the previous applications, this program is still in the demonstration phase and is being evaluated by MGH for possible continuation.

REFERENCES

Information received from Massachusetts General Hospital.

Dranov, P., "Telemedicine," Science Digest, July 1981, pp. 112-114.

CONTACT

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APPLICATION A-5TITLE

Slow-Scan Television in a Rural Environment

TECHNOLOGY

Slow-Scan Television

DESCRIPTION

As a component of a research program undertaken by the Bureau of Community Health Services to identify, analyze, and plan innovative approaches to improving health care in rural, isolated areas, MITRE Corporation developed a series of slow-scan television (SSTV) applications.

BACKGROUND

Slow-scan television is a system that picks up, transmits, stores and displays non-moving pictures over a distance (e.g., image of a patient, an x-ray, an EKG, etc.). The image is picked up by a video camera and transformed electronically into a signal that is transmitted over a dial-up telephone line. Telephone lines are used for cost reasons; seventy-eight seconds are required to transmit the image. The signal is decoded and stored at the receiving location and subsequently transferred to the display monitor.

DOOR COUNTY (Wisconsin)

The Door County Medical Center (Wisconsin) SSTV system characteristics included:

- o Non-moving picture
- o Monochrome (black and white)
- o 78 second transmission time over phone line
- o Limited image quality
- o One or two image storage and display
- o Snapshot or frame-freeze feature
- o Audio tape recording of images
- o Voice and video sent over separate telephone lines

These features were selected to optimize the considerations of image quality, transmission time and equipment cost.

The system consisted of two transmitting and two receiving sites. One site was accessible only by ferry or by airplane and had transmit capability only; another satellite location had both transmit and receive capability; both could send in either frame-freeze or live camera mode. The county hospital had receive capability only. The Door County Medical Center had the ability to both send and receive.

MCKENZIE RIVER (Lane County, Oregon)

An earlier demonstration was conducted at the McKenzie River Clinic to augment telephone conversations between clinic and hospital, thus reducing the need for referring patients to the hospital. Two systems were installed and utilized at various times during the project; both consisted of two-way, slow-scan television configurations.

REFERENCES

Skinner, F., "Door County Medical Center: Slow-Scan Television System Description and Operations Manual," MITRE Corporation Technical Report, MTR-80W211, July 1980.

Rappaport, W.H. et al., "Development and Implementation of the McKenzie River Clinic Telehealth System," MITRE Corporation Technical Report, MTR-7715, April 1978.

MITRE Corporation, Rathbun Area Health Services Slow-Scan Television System Description and Operations Manual," Working Paper, WP79W00845, June 1980.

Strong, H. M., "Review of the Kirksville College of Osteopathic Medicine's Use of Slow-Scan Television for Teleradiology", Working Paper 81W00729, December 1981.

CONTACT

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APPLICATION A-6TITLE

Counseling By Telephone

TECHNOLOGY

Telephone

DESCRIPTION

The telephone presents advantages for use in tracking patients with chronic conditions (e.g., cost-effective for the provider as a way of providing reinforcement to stable patients over time; and convenient for the consumer, thus, saving travel, child care, and waiting time expense). A study was undertaken to ascertain whether telephone counseling of hypertensive patients is as effective as face-to-face counseling in a clinic setting, and whether telephone counseling is a cost-effective technique in patient tracking for helping patients to achieve and maintain blood pressure control.

The study was conducted at the Broadway Health Center, an outpatient primary care clinic of The Johns Hopkins Hospital located in the city of Baltimore.

SAMPLE

Three groups were formed from the 230 eligible patients in the clinic with a history of high blood pressure. The three evaluation groups formed were: (1) telephone counseling; (2) clinic counseling; and (3) usual care controls. The evaluation plan followed a modified pretest-posttest control group design.

RESULTS

Although the author cautions the reader on the results because of the small sample size and lack of random assignment of participants from one large pool of eligible hypertensives, the main conclusions, with those cautions in mind, were that telephone counseling was at least as effective as face-to-face counseling in helping to achieve and maintain blood pressure control. In addition, telephone counseling was about twice as cost-effective as clinic visit counseling as a patient tracking technique.

REFERENCE

Bertera, E.M. et al., "The Cost-Effectiveness of Telephone versus Clinic Counseling for Hypertensive Patients: A Pilot Study," Am J Public Health, June 1981, pp. 626-629.

CONTACT

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APPLICATION A-7TITLE

Teleradiology

TECHNOLOGY

Microelectronics (Computer)

DESCRIPTION

This document is a technical report that presents the results of a laboratory evaluation of a microcomputer-based teleradiology system. The laboratory evaluation compared conventional reading of radiographs with the teleradiology image. The evaluation was conducted in 1980 at the MITRE Telehealth Laboratory and involved twelve radiologists reading a sample of x-ray cases selected to represent the range of cases encountered in general radiologic practice.

Equipment utilized in the evaluation included viewing program hardware with the capability of: digital image storage processing, digital tape mass storage and retrieval; and simultaneous display of two 512 X 512 picture element (pixel) X 8 bit images (256 gray levels). Image acquisition equipment included a camera with a control unit that generated 559 scan lines.

Findings of the evaluation were that: 1) there were consistent differences between teleradiology and, in part, conventional radiographs in terms of the average accuracy of both findings and impressions; 2) confidence is consistently higher for radiographs; 3) radiographs produced a higher proportion of true positive and true negative findings and impressions, and 4) accuracy of findings and impressions utilizing teleradiology did not appear to be significantly correlated with these of the various technical controls or with time spent viewing cases.

The evaluation concluded that despite image quality shortcomings, the incorporation of digital radiography into the teleradiology system should be investigated. Moreover, image quality may be more than adequate when compared to the alternative in many sites - no timely radiological capability.

REFERENCES

Harrington, M.B. et al., "A Laboratory Evaluation of the Technical Performance of the Teleradiology System: Summer 1980," MITRE Corporation Technical Report MTR-81W201, August 1981.

Gaylor, B.W. et al., "Teleradiology: an evaluation of a microcomputer-based system," Radiology, August 1981, pp. 355-360.

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APPLICATION A-8TITLE

Digital Imaging

TECHNOLOGY

Microelectronics (Computer)

DESCRIPTION

Utilizing digital diagnostic imaging system technology, Boston City and Boston University Hospital have established a satellite imaging transmission network; Boston University Hospital will have a satellite CT (computed tomography) unit that will feed into the Boston City Hospital system.

Data received by the satellite is sent by telephone to a control computer at City Hospital, which processes the data and constructs an image. Radiologists at the control location are able to read images sent from the satellite or send them back for transmission and reading at the other hospital. Additionally, the Boston City Hospital equipment utilizes the technology that allows CT, ultra-sound and nuclear diagnostic images to appear side-by-side on a video screen.

A similar CT system was approved by the Health Systems Agency of Southwestern Pennsylvania for shared CT service between Allegheny Valley Hospital (Natrona Heights) and Citizens General (New Kensington).

REFERENCES

Kuntz, E., "Boston City Hospital installs first digital multi-modality imaging unit," Modern Health Care, December 1980 - January 1981, pp. 94-98.

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CONTACT

Not Available

B. EDUCATIONAL APPLICATIONS

EDUCATIONAL APPLICATIONS

Health care education is a second major area of useful, energy-related application of microelectronic and/or telecommunication technology. Two broad audiences have been addressed by these applications: (a) health professionals and (b) consumers.

Health Professionals. - Typical educational applications involving health professionals include both live and videotaped broadcasts of lectures, conferences, "grand rounds", seminars, and workshops. Live broadcasts offer the advantage of spontaneity and instantaneous feedback: depending on the reception/transmission capability of a given location, it is possible to incorporate simultaneous audience interaction. Alternatively, the use of videotaped playback affords health care professionals the opportunity to participate in and progress through the educational experience as time permits; for those with only a one-way video capability, videotaped playback represents the only method of participating from a remote location.

Consumers. - Innovative consumer educational applications have been directed at both patients and the public at large. The applications are divided between disease recognition and treatment on the one hand and health promotion and disease prevention on the other. More generally, these applications are oriented toward promoting medically and socially acceptable behavior through programming aimed at transmitting to the individual an awareness of the implications of certain health-related actions or inactions.

The impact of these applications is potentially far-reaching from several standpoints. The ability to reach large groups of health care professionals from a single location presents obvious savings in terms of travel. Additionally, there are other, intangible benefits in terms of improved patient care resulting from: (1) the ability to diffuse, in a timely fashion, current medical information to health providers and other professionals; and (2) the

ability to reach audiences previously unreached because of the remoteness of their location and/or reluctance (or inability) to travel.

Health education programming directed toward the consumer can also be expected to result in both reduced energy costs and improved health status. While the case for these impacts is perhaps less evident, the argument goes as follows: Programming experiences which permit the consumer to remain in good health, or which induce the consumer to seek health care at a time when such intervention is more likely to prove effective, (a) improve health while (b) reducing the need for physician visits (travel) and hospitalization (cost). Likewise, programming which enables an individual to recognize that physician intervention is unnecessary obviates the need for energy-consuming travel.

The Maine and South Carolina communications networks cited later in this section are examples of educational applications with substantial health professional components. The systems are similar in that they apply non-satellite based television technology employing interactive two-way audio-video communication between selective dispersed sites. This capability allows simultaneous educational interaction between participants. The South Carolina system has been further enhanced by having a network-wide telephone talkback capability which allows sites with a video-only configuration to communicate actively with the live broadcast site. The Maine two-way network is characterized by an integrated microwave radio and slow-scan television configuration.

Each month South Carolina provides over 90 hours of broad-based continuing health education programming to health professionals. Examples of August 1982 programming include, in part: (1) for physicians -- an update on hypertension; management of premature labor; nutrition and fitness; and weekly internal medicine videoconferences; (2) for nurses -- programs on cause, treatment, and prevention of decubitus ulcers; emergency management of cervical-spine injuries;

basic nursing skills; and management and care of multiple trauma patients; and (3) for allied health professionals -- basic nursing skills; safety; and nutrition and fitness.

Similarly, the breadth of Maine's health professional's programming is demonstrated by a review of their recent program offerings, which include: (1) courses that offer approved AMA Category I credit on such topics as Orthopedics, Trauma, Burns, Lymphoma, and Carcinoma of the Colon; and (2) programs for nurses on such topics as liability in nursing and leadership in nursing.

The Greater Cleveland Hospital Association is somewhat different in the manner in which it communicates health professional programming -- broadcasts are transmitted from the local public television station to hospitals for airing over closed circuit television within the hospital.

Each of these systems belongs to the Association of Hospital Television Networks (AHTN). A discussion of AHTN and selected member networks is included in the narrative descriptions which follow (Application B-12).

Contrasted with the above non-satellite based applications, the Army Health Service Command Network is a major example of a satellite-based system that also employs one- and two-way audio and video capability between dispersed sites. The Army system is, much like the South Carolina network, augmented through a telephone talkback capability which allows sites which do not possess two-way audio capability to communicate with the broadcast site.

Recent Health Service Command programming, which focuses on providing timely, accurate, and relevant education and training to all Army Medical Department members, includes topics unique to armed forces responsibility, such as: management of mass casualties; radiation and chemical agent detection; and role of the military psychologist. Examples of medical management fare include: diagnosis and management of colorectal cancer; assisting with minor

surgery; CT scanning in neurodiagnosis; cervical-spine trauma; and acute poisoning management in the emergency room. As many as 300 non-military medical facilities have indicated an interest in participating and interacting with network programming.

Demonstrations conducted in the mid-1970's by the Veterans Administration and the Public Health Service using the National Aeronautics and Space Administration's Communications Technology Satellite (CTS) showed the versatility and impact of utilizing a satellite-based television information transfer. Although the VA experiments were not implemented nationwide, many VA hospitals participate in State/regional/local telecommunication networks, as for example in Maine and Nebraska.

The VA-CTS demonstration, which involved 30 VA hospitals and eight non-VA medical facilities, included two educational components: (1) management teleconferencing, which was intended to replace the need for unnecessary travel by VA staff; and (2) continuing education programming for the health care professional -- physician, nurse, and allied health professional.

The Lister Hill National Center for Biomedical Communications, similarly utilizing the CTS, coordinated a series of Public Health Service-sponsored applications designed to provide health professional education experiences. Examples of teaching broadcasts include: continuing dental education covering office design, accounting principles, and practice analysis (supported by the Health Resources Administration); and patient nutrition assessments (National Library of Medicine and American Dietetic Association). Examples of teleconference broadcasts include: neonatal grand rounds (University of Kentucky, Bethesda Naval Medical Center, Walter Reed, National Library of Medicine); the annual meeting of the American Society for Neurosciences; and the East-West Conference on Holistic Health (Alcohol, Drug Abuse, and Mental Health Administration).

Programs which concentrate upon providing continuing nursing education on a statewide basis have been implemented in both Georgia and Maine. Unlike the above applications, neither of these systems has a video capability; rather, they consist of amplified telephone units that permit interactive audio broadcasting.

The Vermont/New Hampshire (INTERACT) communications network, initially a non-satellite based system, has recently added the capability to receive satellite programming. As such, it is now offering two separate satellite-based educational opportunities not previously available to the system's subscribers: the Army Health Service Command (see above) and Eyesat which offers programming aimed at ophthalmologists.

Although the literature is less replete with consumer-oriented educational applications, there are several non-satellite based television efforts directed toward the public at large. They are (1) the South Carolina Health Communication Network; and (2) the Midwest City, Oklahoma system. The South Carolina programming is broadcast statewide over educational television while the Midwest City transmissions utilize local cable television. The South Carolina system also utilizes FM radio for general public programming. Association of Hospital Television Network (AHTN) literature indicates that several of its member networks have the capability to provide, or are providing, television-based community programming and that at least one national network intends to provide community programming through cable television.

Basic voice-grade telephone lines are utilized to provide health information to the general public in the "Tel-Med" system. Tel-Med, a nationally franchised health information system, offers information via tape-recorded messages on various topics. This system has been implemented in a number of metropolitan areas and offers the public the convenience of obtaining valid medical information without having to leave their home.

The Tel-Med system includes a wide range of topics classified by a series of headings to assist the user in locating their particular subject of interest. The topics covered range from alcohol problems to venereal disease with special sections on children's diseases, male and female disorders, nutrition, physical fitness, and public health.¹

THE SOURCE, a telecomputing and telecommunications system developed by the Source Telecomputing Corporation, provides subscribers with access to a diverse set of data bases, including a Home Medical Guide ("Care"). The guide is designed to provide the consumer with information to make sound judgments about common illnesses and ailments. The Care program, unlike Tel-Med, is designed to allow the user to progressively narrow the diagnosis; comments and treatment recommendations based upon the indicated symptoms are provided. The program of self-diagnosis featured in this system was derived from a book by Donald M. Vickery, M.D., and James F. Fries, M.D.²

In addition to the community-oriented programming described above, several educational efforts are directed specifically toward patient populations. The Greater Cleveland Hospital Association, for example, as a part of its network services offers closed circuit programming to patients. Also, several new efforts are currently underway by various AHTN members and a prospective national satellite network intends to provide daily patient education programming.

In contrast to the above described use of telecommunications, microcomputer applications in the field of health care education have had a less clearcut impact on energy. There are, however, at least two applications where such an

¹ While some of these tapes are on relatively occult subjects, the relevance of others is beyond dispute: the Tel-Med program of a suburban Los Angeles hospital, for example, features a tape entitled "What to Do During a Smog Alert"!

² Vickery, D. M. and Fries, J. F., "Take Care of Yourself: A Consumer's Guide to Medical Care," Addison-Wesley, 1976.

impact has either been demonstrated or can be inferred. One such application (in Evergreen Park, Illinois) involves the use of a microcomputer to aid in screening hospitalized patients to identify those who might be suitable subjects to receive designated in-house patient education programs; a second application (in a VA hospital) involves computer-assisted instruction in an interactive mode where the patient can control the flow of material. To the extent that these applications reduce, ultimately, unnecessary travel for medical care, they may be said to have an expected energy (as well as overall cost) impact.

APPLICATION B-1TITLE

South Carolina Health Communications Network

TECHNOLOGY

Closed-Circuit Television
Telephone
FM-Radio

DESCRIPTION

The South Carolina Health Communications Network (HCN) was established in May 1969 with a link to four hospitals and the Medical University of South Carolina via telephone lines and the use of videotaped programs at each participating hospital. The initial HCN goal was to provide physicians and other health care personnel with educational opportunities concerning pediatric cancer.

The HCN is now a full-color broadcast facility whose goal is to anticipate and respond to the needs of health professionals and hospital support personnel. HCN now links 30 hospitals to the University of South Carolina's School of Medicine and the Medical University of South Carolina via closed circuit television. Health information programs designed for the public are broadcast weekly throughout the state on open circuit educational television and FM/radio. The system's closed circuit link is further augmented by a network-wide telephone talkback system and a two-way interactive video capability in four sites the four major teaching hospitals in Columbia, Spartanburg, Greenville, Charleston and the MUSC.

This two-way video capability in the five sites, combined with the network's telephone talkback system, allows the simultaneous origination and broadcast of "grand rounds" on a regular basis in Family Medicine, OB/Gyn, Nursing and Psychiatry. Audiences at the 26 hospitals view the live broadcasts and participate through the talkback system. The HCN reports that the two-year "grand round" series has been attended by over 4,000 physicians and health care personnel.

Another example of a successful HCN event was the presentation of a live three-day accredited seminar entitled "Next Steps in Implementing Quality Appraisal/Action Plans in Hospitals." HCN reports that 286 health professionals earned continuing education credit while remaining at their own institutions.

Exhibit 1 depicts the HCN projected savings utilizing the network as opposed to conducting the seminars in either Atlanta, GA or Columbia, SC.

EXHIBIT 1

COMPARISON OF COSTS
FOR EQUIVALENT QUALITY ASSURANCE SEMINARS

<u>Atlanta</u>		
<u>Air Fare</u>	<u>Registration Fees</u>	<u>Lodging, Food,</u>
<u>Atlanta</u>	<u>\$195 each *</u>	<u>Taxi, Parking</u>
\$47,042	\$55,770	\$84,799
Total Cost - \$187,611		
Average Cost Per Person - \$655.98		
<u>Columbia</u>		
<u>Travel Cost</u>	<u>Registration Fees</u>	<u>Lodging, Food,</u>
<u>To Columbia</u>	<u>\$195 each *</u>	<u>Taxi, Parking</u>
\$2,704.80	\$55,770	\$30,381
Total Cost - \$88,855.80		
Average Cost Per Person - \$310.68		
<u>Broadcast Over TV by HCN-DCE</u>		
Total Cost to Hospitals - \$8,610		
Average Cost Per Person - \$30.10		

* \$195 registration fee is the average for seminars scheduled by the "Education Division of the Joint Commission for Accreditation of Hospitals."

REFERENCES

Information from the South Carolina Health Communication Network

Keefe, J.C.S., "Live Interactive Television: The Medical Grand Rounds." Paper presented at the International Conference in Teleconferencing in Madison, Wisconsin.

CONTACT

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APPLICATION B-2TITLE

THE SOURCE - Home Medical Guide (Care)

TECHNOLOGY

Microelectronics (computer)

DESCRIPTION

THE SOURCE, a telecomputing and telecommunication system developed by Source Telecomputing Corporation, can provide system subscribers access to a wide variety of information; including a program entitled Home Medical Guide (Care).

Care is an interactive program designed to provide the system user with information about common illnesses and ailments in order to assist the consumer in making specific judgments, e.g., assisting in distinguishing between minor problems and those that require the attention of a physician.

The program is derived from the work of Drs. Donald M. Vickery and James F. Fries. Twelve main categories are used in Care (e.g., poisons, common skin problems; ear, nose, and throat; childhood rashes and fever; for women only). These categories cover such diagnoses as colds, flu, nausea, sore throat, and swollen glands. THE SOURCE notes that Care is not intended to substitute for emergency first-aid treatment or a visit to your doctor, but to help the consumer make educated diagnoses of minor ailments which can be treated at home.

REFERENCES

Information obtained from THE SOURCE

Information obtained from Dr. Donald M. Vickery

CONTACT

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APPLICATION B-3TITLE

Intrastate Health Communication Network (Vermont and New Hampshire)

TECHNOLOGY

Microwave Television

DESCRIPTION

The INTERACT television network, a non-profit communications network based at Dartmouth College, and part of the Medical School, is a two-way television communication system based on a series of microwave links that connect seven stations throughout the states of Vermont and New Hampshire. These stations are: (1) St. Albans Correctional Facility, St. Albans, Vermont; (2) University of Vermont/MCHV, Burlington, Vermont; (3) Central Vermont Medical Center, White River Junction, Vermont; (5) Dartmouth-Hitchcock Medical Center, Hanover, New Hampshire; (6) Claremont General Hospital, Claremont, New Hampshire; and (7) Brattleboro Affiliated Institutions, Brattleboro, Vermont.

On a daily basis programs are broadcast or aired among the network's seven locations. Categories of programming include: (1) training and staff education; (2) workshops; (3) governmental hearings; (4) patient care education; (5) undergraduate, graduate, and continuing education; (6) consultations; and (7) seminars. In addition to having the ability to link within the network through microwave satellite communication, INTERACT can tie-in to other stations outside of the network.

Statistics published in the August 1982 INTERACT TV Guide reveal that for the fiscal year the seven institutions watched 2,950 network hours (medical and non-medical programming), with 24,830 viewers watching a total of 1,473 programs. These figures, it is noted, do not reflect "extensive tape rentals that were made to non-member institutions for their staff viewing."

REFERENCE

Information obtained from INTERACT

CONTACT

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APPLICATION B-4TITLE

Maine Health Communications Network

TECHNOLOGY

Slow-Scan Television
Microwave Radio

DESCRIPTION

Medical Care Development, Inc., a non-profit organization, has sponsored the development of two telecommunications systems that enable health care providers to access educational resources and communicate ideas.

The Central Maine Interactive Telecommunications System (CMITS) is a two-way television network which provides four sites (Central Maine Medical Center in Lewiston; Kennebec Valley Medical Center, Maine-Dartmouth Family Practice Residency and the University of Maine in Augusta; the Veterans Administration Center at Togus; and Mid-Maine Medical Center in Waterville) with the mechanism to communicate ideas and share resources. The System utilizes microwave radio communication equipment in combination with automatic switching equipment to create a user operated interactive telecommunications system.

The CMITS is used for meetings, continuing medical education, college credit and non-credit courses, nursing programs, consultative activities and faculty development.

The Aroostook County Telecommunications System (ACTS) combines telephone and television technologies to provide five sites (the Aroostook Medical Center, Community General Division in Fort Fairfield and A.R. Gould Division in Presque Isle; Cary Medical Center in Caribou; Houlton Regional Hospital in Houlton; and Northern Maine Medical Center in Fort Kent) with a teleconferencing system that utilizes slow-scan television which transmits and receives via regular telephone lines.

Use of the ACTS is coordinated by Northern Maine RAISE (Regional Approach to Improved Health Services through Education), which is a shared educational service supported by Aroostook County hospitals.

REFERENCES

Medical Care Development, Inc., "Information for the Effective Use of Interactive Telecommunications," April 1981.

Medical Care Development, Inc., "The Design, Construction, and Implementation of the Interactive Telecommunications System for Central Maine," February 1979, Veterans Administration, Contract EMI-75-002-01, EM-78C-001-01.

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APPLICATION B-5TITLE

Army Health Service Network

TECHNOLOGY

Satellite

DESCRIPTION

The United States Army Health Services Command operates the HSC-TV Network; a satellite television network with both one-way video and two-way audio capability. Broadcasts originate from television studios at the Academy of Health Sciences (AHS), US Army, Fort Sam Houston, Texas, and microwaved to Dallas, Texas, where they are uplinked to the WESTAR III Satellite. The signal is then beamed back to six sites: Forts Sam Houston and Hood in Texas; Fort Sill in Oklahoma; Fort Polk in Louisiana; Fort Campbell in Kentucky; and Fort Leonard Wood in Missouri.

The primary aim of the HSC-TV Network is to provide timely, accurate, and relevant education and training to the Army Medical Department member. The network consists of "live" telecasting of graduate medical education (the BAMC Hour) to physicians, nurses, dentists, and other professional medical personnel. This activity began in November 1979, at Brooke Army Medical Center (BAMC). In January 1981, the Academy of Health Sciences commenced a new "live", interactive program entitled "Studio B". Studio B's aim is to enhance the readiness-oriented training of medical technicians taught at AHS. Live broadcasts are supplemented by "questions" through AUTOVON or commercial collect telephone calls.

Specific applications include two video conferences held in 1980, and one in 1981 from Letterman Army Medical Center in San Francisco and from WRAMC in El Paso, Texas. These applications of video conferencing have resulted in estimated "cost avoidance" of almost \$500,000. Expansion is currently increasing in the programming and network areas.

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APPLICATION B-6TITLE

Veterans Administration Biomedical Experiments Utilizing the Communications Technology Satellite

TECHNOLOGY

Satellite

DESCRIPTION

The Veterans Administration operates and maintains one of the largest health care systems in the free world; 172 hospitals and 42 independent and satellite outpatient clinics (1979). Geography, size, and services present a diverse set of problems in being able to provide consistent high quality medical care to its clients.

Background

Early experimental television efforts (based upon initiatives under the 1966 Exchange of Medical Information Act) included the Nebraska VA Television Network which provided an interactive link between the Omaha VA Hospital and the Nebraska Psychiatric Institute. By 1974 this system had grown to include the VA hospitals in Lincoln and Grand Island, Creighton University's medical teaching affiliate in Omaha, St. Joseph's Hospital and the University of Nebraska College of Dentistry in Lincoln; another effort involved utilizing the Medical Television Network of UCLA to provide videotapes of broadcast programs to 30 remotely located hospitals. This effort was later expanded to 90 remote hospitals.

The limitations of these early television efforts was that the use of videotape and film did not allow for the immediate interchange between participants. Consequently, in 1975, the first VA experiments on a communications satellite were begun in 10 VA hospitals in the Appalachia region. The experiment was conducted within the NASA Application Technology Satellite (ATS) program. From May 1974 to June 1975, 68 broadcasts of two hours each were provided for the hospitals. Based on the Appalachia experience, the VA decided to continue its experiments using NASA's Communications Technology Satellite (CTS).

CTS Experience

In order to vary the CTS experiment as much as possible from the ATS-6 experience, CTS focused on 30 VA facilities located in the Western United States. The CTS experiment was "undertaken to further examine the value of satellite communications for mediating the requirement for a free flow of information throughout its health care system." Specific intents, in part, included: (1) providing current medical information to health professionals in urban and remote locations; (2) demonstrating use of two-way television

audio and other electronic messages carried by satellite; (3) providing information to large groups of users at one time; and (4) providing hospitals in remote locations with access to scarce resources.

Six categories of projects were selected to support the study objectives. Categories to be included in the experiment were: (1) teleconsultations; (2) management teleconferences; (3) continuing education for professional certification; (4) allied health programming; (5) patient education and exchange; and (6) VA National Medical Satellite Journal.

Conclusions

The general conclusion reached following both the ATS and CTS experimentation was that "satellite communication interconnections can effectively provide the VA with an accessible means of extending scarce resources, training, and educational opportunities, and current medical research and technical information to its remote facilities." Cost effectiveness was not a primary objective in either the ATS-6 or CTS experiments.

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APPLICATION B-7TITLE

Public Health Service Biomedical Experiments Utilizing the
Communications Technology Satellite

TECHNOLOGY

Satellite

DESCRIPTION

In January 1976, the National Aeronautic and Space Administration in cooperation with Canada's Department of Communications, launched the Communications Technology Satellite (CTS) which had the capability of transmitting simultaneous two-way color television programs between sites as widely separated as six time zones.

During 1977 and 1978, the National Library of Medicine's Lister Hill National Center for Biomedical Communications developed earth terminals and coordinated information transfer broadcasts using CTS. The network consisted of six Public Health Service (PHS) ground stations located in Bethesda, Maryland; Bozeman, Montana; Denver, Colorado; Fairbanks, Alaska; Lexington, Kentucky; and Seattle, Washington.

Using this experimental broadband video network, a range of medical and professional topics were explored including dissemination of medical research results to researchers and practitioners; continuing education courses for dentists, dieticians, and nurses; medical grand rounds; health-related conferences; and professional meetings.

Exhibit 2 summarizes the various health-related CTS experiments conducted under the aegis of the PHS; this summary is taken directly from the Biomedical Communications Experiments System Evaluation (see references).

Through October 1978, there had been 146 broadcasts at the Bethesda site, totaling 364 hours of broadcasting time involving over 1500 participants. In addition to a comprehensive in-house technical evaluation, the Lister Hill Center contracted for a study to conduct a user-oriented system evaluation. These findings are presented in four separate documents that discuss the various aspects of the experiments.

Based upon an analysis of the results of the various experiments, the evaluators concluded that:

- o Satellite technology is highly reliable and capable of providing high quality audio and video for:
 - face-to-face interaction
 - graphics presentations and discussions
 - technique demonstrations
 - didactic lectures

1. TELEMEDICINE

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g. Other or Unknown

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Palos Community Hospital (Palos Heights, IL), faced with the need to expand its telephone system, carefully assessed its needs and determined that a solid-state computerized telephone system was required. The detailed workload analysis that preceded system selection led to advanced problem solving and a trouble-free installation.

* Not reviewed

2. ADMINISTRATIVE APPLICATIONS (cont'd)

g. Other or Unknown (cont'd)

*Harrison, S.E., "Health service computing: putting the patient on line," Health Soc Serv J, January 30, 1981, pp. 106-8.

Hartizan, E.G., Brown, J., "Computers," Nursing Management, August 1982. [B-16]

*Jacobs, D.M., King, D.B., "New dimension: on-line, real-time, direct communication," Hosp Fin Mgt, August 1980.

*Magerlein, D.B. et al., "New systems can mean real savings," Hosp Fin Mgt, May 1978.

Mitre Corporation, "Computer-Based Health Information Systems for Rural Areas: An Analysis of Demonstration Potential," July 1978, Technical Report, Bureau of Community Health Services, Contract CS-D-000001-01-0.

Four recently developed (1978) computer-based health information systems were studied to determine their applicability and potential transferability to various models of rural health care delivery. The report outlines the characteristics and transfer potential of the four systems.

Murphy, J. et al., "Hospital harnesses computers' capabilities to spot, solve problems in patient education programs," Promot Health, November-December 1980, pp. 1, 3. [B-16]

*Peel, V.J. et al., "Computers in in-patient information systems - an alternative, local approach," Hosp Health Serv Rev, January 1981, pp. 5-8.

Reilly, D., "A Computerized Patient Information System," Nursing Management, August 1982, pp. 32-36. [B-16]

*Schwartz, M.D., "Analysis of hospital computer networks," J Clin Eng, October-December 1980, pp. 311-20.

Silverman, R.P., "The use of computers in long-term care," J Long Term Care Adm, Winter 1978, pp. 30-40.

*Simpson, J.N., "How Richmond Memorial's computer eases controls and outside reporting demands," Hosp Top, January-February 1981, pp. 40-1.

* Not reviewed

2. ADMINISTRATIVE APPLICATIONS (cont'd)

Traska, M.R., "Methodist of Indiana tailors patient computer system to hospital routine," Modern Health Care, October 1978, pp. 34-39.

Discusses the planning, installation, and implementation of a computerized management information system in the Methodist Hospital of Indiana (Indianapolis, IN). System adaptations and modifications made prior to installation led to a system that met hospital needs. The modified MIS has brought about a number of patient benefits including reduced length of stay, reduced nursing errors (80% of the medication errors that had occurred before the new system were eliminated), and faster diagnoses through fast turn-around on test results.

Tyons, C. et al., "Interactive Computerized Patient Education," Heart and Lung, July-August 1982, pp. 340-1. [B-15]

*Young, D.W., "The use of computers in patient administration systems," Hosp Health Serv Rev, January 1981, pp. 8-11.

*_____, "Minneapolis hospitals share unique management information system," Comms N, April 1980.

*_____, "Computer expands staffing capabilities," Modern Health Care, May 1979, p. 85.

*_____, "Monitoring care by computer: a new system helps medical staffs keep tabs on costs," Cost Containment, June 1981, pp. 3-6.

* Not reviewed

3. ENERGY MANAGEMENT/CONSERVATION

*Choksi, N., "Energy Management: Modifications and Monitoring," Heating-Piping, January 1980.

*Hyman, W.A., "Energy conservation in hospital buildings," Bldg Syst Design, October 1979.

*Janissee, N., "Conserving energy without patient discomfort," OH, July-August 1980, p. 23.

*Jeffries, J. et al., "Engineering: energy management can be your success story." Hosp Top, May-June 1979, pp. 444-8.

Khosla, N.K., "Systems for energy control management," Hospitals, October 16, 1980. [C-1]

*Koehler, W., "Reduced energy use occurs despite facilities growth," Specif Eng, March 1980.

Lunde, B., "New dimension in hospital management (Bell System energy system)," Telephony, June 1981. [C-2]

*Norland, J., "\$134 switchover saves Denver Hospital \$133,000/yr in cooling energy costs," Air Cond Heat and Refrig, December 17, 1979.

*Preswick, E.J., "Energy recovery from hospital wastes," Specif Eng, April 1978.

Reynolds, M., "Microprocessor techniques in energy conservation," Hosp Eng, December 1980, pp. 15-7. [C-1]

*Stetynski, A., "Harnessing computers to manage energy and contain costs." Comput Hosp, November-December 1981, pp. 46-9.

Strohl, G.R., Jr., "Phone system cuts energy use, emergency response time," OH, September 1981, p. 23. [C-2]

*Wright, C.R., "How CFOs can conserve energy resources," Hosp Fin Mgt, January 1982.

_____, "Controlling Energy Through Microprocessor Utilization," Association of Physical Plant Administrators of Universities and Colleges - Energy Task Force, 1980. [C-1]

_____, "Energy Issues in Health," DHEW Publication No. (HRA) 79-14510.

This publication presents a series of articles which address energy issues in health as evidenced in three areas: (1) health planning; (2) health care administration; and (3) research and data. The purpose of these articles is to "focus attention on the interrelationships, issues, and dilemmas that conscious attention to energy brings to those in the Health Sector."

3. ENERGY MANAGEMENT/CONSERVATION (cont'd)

* _____, "Hospital milks underground heat," Eng N, September 14, 1978.

* _____, "Hospitals add up simple energy savings," Eng N, April 26, 1979.

* _____, "Lowering the energy bill," Adm Mgt, February 1979.

* _____, "Computer system reduces energy costs." Hosp Prog, November 1979, p. 40.

* _____, "Hospital wins energy management award," Purch Adm, April 1979, p. 14.

* _____, "At Minneapolis hospital, waste-to-energy system yields cash from trash," Air Cond Heat and Refrig, January 26, 1981. February 1979.

* _____, "Blues aid in hospital energy conservation," Risk Mgt, December 1980.

_____, "Cost Containment in Hospitals through Energy Conservation," DHEW Publication No. (HRA) 79-14511.

The results of energy conservation efforts in various medical facilities are reported. The results are based upon a national survey of select facilities including: (a) small, medium, and large; (b) teaching centers, (c) VA facilities; and (d) centralized service facilities. These case histories were intended to motivate and provide guidance in the area of energy conservation.

_____, "Energy Impacts on the Health Care System - Summary of Conferences," DHHS Publication No. (HRA) 81-14514.

and

_____, "Energy Contingency Planning," DHHS Publication No. (HRA) 80-14512, June 1980.

During the 1979-1980 period, the Bureau of Health Facilities, Division of Energy Policy and Programs, conducted six conferences on energy contingency planning for health care facilities. Combined attendance was 250 individuals representing a broad spectrum of health and energy interests. The first report summarizes the presentations and conclusions of each of the latter five conferences; "Energy Contingency Planning" describes the proceedings of the first two-day conference held in September 1979.

_____ "Hospital PBX system also handles energy management," Comms N, September 1980. [C-2]

* Not reviewed

4. GENERAL INTEREST (UNCLASSIFIED)

*Fox, J., "Development of hospital computing," J R Soc Med, June 1979, pp. 425-31.

*Harris, D.K., "Cost containment and computer technology," J Med Syst, 1979, 3(3-4), pp. 213-5.

*Hills, P., "Computers in hospital: the first ten years," Health Soc Serv J, August 14, 1981, pp. 986-7.

*Jenkin, M.A. et al., "A user-oriented computer interface for health professionals," J Med Syst, 1980, 4(2), pp. 91-105.

*Laska, E.M. et al., "Medical information systems," Annu Rev Biophys Bioeng, 1980, pp. 581-604.

*McIntyre, N. et al., "Computers in hospital: instant information," Health Soc Serv J, August 14, 1981, pp. 980, 982-4.

Potter, J.G., Ferrell, T. E., Brown, J. H., "Health Information Networks: A Coming Trend?," Hospitals, January 1, 1981, pp. 65-68.
[B-12]

*Seaver R.E., "Benefits of hospital based systems," Comput Hosp, May-June 1981, pp. 26-9, 32.

*Scholes, M., "An overview of the use of computers in nursing," R Soc Health J, February 1979, pp. 8-9.

*Uhr, L. et al., "Toward adaptive (computer-based) hospital care systems that can grow and improve as a function of user participation," Int J Biomed Comput, May 1979, pp. 191-203.

*Wiederhold, G., "Database technology in health care," J Med Syst, 1981, 5(3), pp. 175-96.

*Williamson, S., "Tulsa's on-board computers: a glimpse at the future?" JEMS, July 1980, pp. 33-4.

*_____, "Computers -- use in health care," Med Mark Media, February 1980, pp. 24-6, 28-9.

* Not reviewed

- o Geographic distances do not affect telecasts.
- o Satellite communications provide opportunities for resource sharing between institutions.
- o Satellite communications provide the capability for many students and professionals to interact with leading researchers and clinicians, all of whom are geographically separated.
- o Instruction implemented by two-way video communication via satellite is as effective for learning as other interactive modes, including in-person instruction.

Further conclusions were that:

- o Two-way video is needed especially for the exchange of visual information as, for example, in the case of medical procedure demonstrations, review of graphic material, and solving complex problems.
- o Commercial television production standards (e.g., use of sophisticated equipment and large professional support staff) are not needed for effective teleconferences or teaching programs.
- o Satellite video communications can be used effectively by teleconference and teaching participants with little specialized training.

REFERENCES

MITRE Corporation, "Biomedical Communications Experiments Using the Communications Technology Satellite - Executive Summary (Document 1); System Evaluation (Document 2); Symposium Proceedings (Document 3)," 1979.

Thoma, G.R., "Biomedical Communications Experiments - Using the Communications Technology Satellite - Technical Evaluation," Lister Hill National Center for Biomedical Communications, August 1979.

CONTACT

Lister Hill National Center for Biomedical Communications
National Library of Medicine
8600 Rockville Pike
Building 38A
Bethesda, Maryland 20209

EXHIBIT 2

SUMMARY OF HEALTH-RELATED CTS APPLICATIONS

CTS USE	TELECAST FORMAT	IMPLEMENTING AGENCY	SUPPORTING AGENCY
1 NCAST—Nursing Child Assessment Satellite Training	Teaching	University of Washington, School of Nursing	Health Resources Administration (HRA)—Division of Nursing
2 Continuing Dental Education—Dental Office Design	Teaching	Consortium of Health Systems Research Division of the University of Florida and Schools of Dentistry at the Universities of Colorado, Kentucky, Maryland, and Washington	HRA—Division of Dentistry
3 Continuing Dental Education—Accounting Principles	Teaching	Same as above	Same as above
4 Continuing Dental Education—Practice Analysis	Teaching	Same as above	Same as above
5 WAMI—Faculty Sharing	Teleconferences and teaching	University of Washington in four-state consortium: Washington, Alaska, Montana and Idaho (WAMI)	HRA—Division of Medicine
6 WAMI—Independent Learning	Teleconferences and teaching	Same as above	Same as above
7 Project REACH—Burn Treatment	Teleconferences	University of Washington	National Institutes of Health
8 Project REACH—Various Medical Topics (University of Colorado)	Teleconferences	University of Colorado	Same as above
9 Project REACH—Various Medical Topics (Medical University of South Carolina)	Teleconferences	University of South Carolina	Same as above
10 East West Conference on Holistic Health	Teleconferences	East-West Society for Holistic Health	Alcohol, Drug Abuse and Mental Health Administration (ADAMHA)—National Institute on Drug Abuse (NIDA)
11 Drug Abuse—Kop House	Teleconferences	Booker T. Washington Foundation	ADAMHA—NIDA
12 Drug Abuse—Youth SATCON II	Teleconferences	Drug abuse presentation teams	Same as above
13 STARDATE—Patient Nutrition Assessment	Teaching	American Dietetic Association	National Library of Medicine
14 STARDATE—Assertiveness Training	Teaching	Same as above	Same as above
15 STARDATE—Successful Patient Education	Teaching	Same as above	Same as above
16 Annual Meeting—Society for Neurosciences	Teleconferences	American Society for Neurosciences	National Library of Medicine
17 Symposium on the Family	Teleconferences	Institute for Pediatric Services and two children's hospitals	National Library of Medicine
18 Neonatal Grand Rounds University of Kentucky	Teleconferences	University of Kentucky, Bethesda Naval Medical Center, Walter Reed Hospital	National Library of Medicine
19 Annual Meeting—Greater Cleveland Hospital Association	Teleconferences	Greater Cleveland Hospital Association	National Library of Medicine
20 Allied Health Conferences Tuskegee Institute and The George Washington University	Teleconferences and teaching	Booker T. Washington Foundation, Tuskegee Institute, The George Washington University	National Library of Medicine

APPLICATION B-8TITLE

Cleveland Metropolitan Area Health Education Network

TECHNOLOGY

Closed-Circuit Television

DESCRIPTION

Since 1972, the Greater Cleveland Hospital Association (GCHA) has used a form of closed-circuit television for delivering educational programming to health personnel. In January 1978, GCHA members via the Health Education Television Network (HETN) began broadcasting patient education programming over a second channel. Broadcasts are transmitted from the local public television station via a special frequency to hospitals with receiving equipment.

The HETN broadcasts 12 hours a day, 7 days a week. Participating hospitals (16 hospitals reported in the article) have 90 broadcast programs available. The network regularly repeats 40 programs with the remaining 50 available upon request. The programming repeats periodically during the week at various times of the day. The entire schedule repeats each week and runs for approximately three months.

A survey conducted by A.C. Nielson for GCHA and the American Hospital Association among 500 rooms of seven hospitals during a one week period (August 27 to September 2, 1979) revealed that: (1) an average of 5 to 7 percent of the patients who were watching television at a given time were watching HETN, (2) on the average, 36 percent of all patients in the surveyed hospitals watched HETN at some time during the week.

REFERENCES

Mancini, L.J., Santich, R.J., "Making TV Work: Some lessons learned by Cleveland's hospital network," Promoting Health, January-February 1981, pp. 4-6.

RELATED ARTICLE

_____, "Personal touch makes a difference at Cleveland area hospitals," Promoting Health, January-February 1981, p. 6.

CONTACT

Greater Cleveland Hospital Association

APPLICATION B-9TITLE

Statewide Education Programs (Maine and Georgia)

TECHNOLOGY

Telephone

DESCRIPTION

The Maine Telelecture Project is an ongoing series of educational opportunities delivered via a communication network that links the University of Maine's School of Nursing, Bureau of Continuing Education for Nursing to hospitals and health facilities throughout the state. The system connects 39 amplified telephone units to a statewide, interactive private audio communications network.

All courses were designed specifically for the telelecture program. The program has continued statewide since 1976.

In 1980 the Georgia Hospital Association (GHA) began utilizing the GHA private telephone network (Telenet) to beam continuing education courses to nurses and other professionals in 82 subscribing hospitals.

The first attempt utilizing telenet involved a specially devised telecommunications curriculum that was broadcast to 72 returning RNs in 11 hospitals across the state. The 8-week course offered 191 hours of instruction: 79 didactic integrated with 93 hour clinical, 16 hours directed study, and 3 hours for examinations.

REFERENCES

Rost, M.A. et al., "Evaluation of Maine's Telecture Continuing Education Program: Part I," Journal of Continuing Education in Nursing, November 1, 1981, pp. 20-25.

_____, "Telecommunications Network Used to Beam RN Refresher Course to Georgia Hospitals," American Journal of Nursing, July 1981.

CONTACT

Not available

APPLICATION B-10TITLE

Health Education Utilizing Cable Television

TECHNOLOGY

Cable Television

DESCRIPTION

The provisions of many cable television franchises awarded by municipal governments require that cablevision firms provide the community with access to the cable for production of programs of local interest. In many instances, governments require that a certain amount of time be allotted for programs that originate locally. As such, opportunities exist for hospitals to play an important role in providing programs of special interest and benefit.

Midwest City Hospital, a 178-bed municipal hospital in a suburb of Oklahoma City, produced the first local cable TV series on medicine and health in Oklahoma - "Alive and Well: Family Centered Health Care". The program, which appeared twice a week for a half hour, was sponsored jointly as a public service by the cablevision company and Midwest City Hospital. The first series of 13 shows began in April of 1980. A second "Alive and Well" series began in October 1980, and additional series are planned.

The first series included among others, programs on cataract surgery, childbirth, geriatric care, and discussions of hospital costs. The second series has been improved through the use of slides, special effects and visual aids. To complement the series, a speakers' bureau has been planned, marketing aids developed, and tapes produced for the hospital's patient education network.

REFERENCE

Greisen, D., "Opportunity knocks, suburban hospital answers by producing health care education series for cable TV," Promoting Health, May-June 1981, pp. 4-7.

CONTACT

Mrs. Dee Greisen
Director, Community Relations
Midwest City (OK) Memorial Hospital
Midwest City, Oklahoma 73110

APPLICATION B-11TITLE

National Health Care Satellite Networks

TECHNOLOGYSatellite
Cable TelevisionDESCRIPTION

The rapid advances in telecommunications technology have led to a number of commercial proposals that seek to establish a national health care satellite TV network. The June 1, 1982, issue of Hospitals briefly describes five of the proposed commercial satellite proposals.

The following information from the article contains for each offeror a brief description of their goals, their address, telephone number, and contact.

CompanyProposal

American Hospital Video Network (AHVN)
67 Peachtree Park Drive, N.E.
Atlanta, GA 30309
(404) 351-4523
Leslie Norins, M.D., Ph.D.

Intends to broadcast eight hours a day, five days a week; programming would cover 65 categories of continuing education for the hospital staff.

American Network, Inc.
735 North Water Street
Milwaukee, WI 53202
(414) 276-2222
Joseph Checota

Intends to begin in June, 1982 broadcasting three hours of patient education programming each day on a variety of topics.

Cable Health Network, (CHN)
2401 West Olive Avenue
Burbank, CA 91506
(213) 557-5940
Arthur Ulene, M.D.

Scheduled to begin June 30, 1982 and targeted primarily at consumers directed mainly at residential viewers who will receive the service through cable company hookups.

Eyesat
3655 Vista Avenue
St. Louis, MO 63110
(314) 771-1122
Judy Feldworth

Proposed to begin in July, 1982, this is a not-for-profit venture of the St. Louis University Medical School aimed at ophthalmologists in their homes, offices, or at hospitals. Programming will consist of 64 credit hours of continuing education in ophthalmology.

Hospital Satellite Network (HSN)
Box 28, Suite 250
1438 North Gower Street
Los Angeles, CA 90028
(213) 464-8575
Steve Laxineta
Ronald Pion, M.D.

Planned to commence by the end of 1982, broadcasting 10 hours per day seven days a week; will offer a full range of educational programming for health care personnel and management.

REFERENCE

Richard, G., "Television - Year of Decision on National Network," Hospitals, June 1, 1982, pp. 73-81.

CONTACTS

As shown above

APPLICATION B-12TITLE

Hospital Television Networks

TECHNOLOGY

Satellite
Microwave Television
Cable Television

DESCRIPTION

The Association of Hospital Television Networks (AHTN) is a national non-profit educational consortium whose members are regional networks that provide educational television programming to hospitals. Although these members may have implemented programs that advance beyond educational applications, AHTN focuses primarily upon the development and implementation of continuing education programming in the health care professions.

The AHTN network currently has 33 members that provide educational services to almost 700 hospitals utilizing diverse telecommunication technologies (microwave, satellite, cable). Networks cover both statewide and metropolitan areas.

A recent AHTN survey of live locations (transmitting sources, as reported by AHTN) reveals:

Total Live Locations:	361
Total Live Hospitals:	310

Hospital Size by Bed (304 reporting)

< 100	34
100 - 200	67
200 - 300	58
300 - 400	44
400 - 500	37
500 +	64

Total Beds Served:	104,383
Average Size by Bed:	343
Total Employees Served:	286,600
Average Hospital Staff:	1,009
Teaching Hospitals:	151

Exhibit 3 lists current AHTN members; Exhibit 4, for selected members, briefly describes specific network operations.

REFERENCES

Information obtained from the Association of Health Television Networks

Caruba, A., "Satellite TV: New Way to Educate Physicians," Public Relations Journal, October 1981, p. 20.

CONTACT

David W. Shively
Director
Association of Hospital Television Networks
P.O. Box 118
Gates Mills, OH 44040
(216) 951-6682

EXHIBIT 3

Birmingham Regional Hospital Council
 Greater Cleveland Hospital Association
 Milwaukee Medical Instructional TV
 Medical Care Development (Maine)
 University of Texas, Houston
 Interact TV Network (New Hampshire/Vermont)
 Harvard Instructional TV Network
 Emory Medical TV Network
 The Johns Hopkins University
 Louisiana Health TV Network
 South Carolina Health Communications Network
 Ohio Valley Medical Microwave
 University of Cincinnati
 Hahnemann Television Network
 Medical College of Georgia
 Dallas Hospital Television System
 University of Connecticut Health Network
 University of Indiana: Medical Resources
 Nebraska VA TV Network
 Center for Excellence, Williamsburg, VA
 Northwest Oregon Council of Hospitals
 Hospital Council of Western Pennsylvania
 The Cleveland Clinic Foundation
 St. Vincent Hospital: Billings MT
 Hospital Association of Metropolitan St. Louis
 Kansas City Area Hospital Association
 Hospital Council of Southern California
 Hospital Council of Central Pennsylvania
 Delaware Valley Hospital Council
 University of Texas, San Antonio
 West Suburban (Boston) Hospital Association
 Hospital Council of Central New York
 Sacred Heart Medical Center, Spokane, WA

EXHIBIT 4

CINCINNATI: The University of Cincinnati operates a microwave network which connects the University with nine locations, including six teaching hospitals, in the Cincinnati area. Network programming includes programs for physicians and hospital professional staffs.

CENTRAL MAINE: This two-way system interconnects 12 hospitals and one university facility in Central and Northern Maine, providing two-way staff conferencing and educational programming for medical and professional hospital staffs.

DALLAS: The Dallas network is operated by the University of Texas Health Science Center. It provides programming to seven institutions in Dallas, all of which are large teaching hospitals.

ATLANTA: This network, operated by Emory University, provides medical programming to 23 locations, including 12 Atlanta hospitals and 11 related health science schools and institutions.

CLEVELAND: The Cleveland network is operated by the Greater Cleveland Hospital Association. It provides programming for physicians, staff and patients to 28 locations, including 25 hospitals, in the greater Cleveland, Lorain, and Akron areas.

PHILADELPHIA: The Hahnemann Network provides programming to 8 locations in the Philadelphia and Scranton/Wilkes-Barre region. The two-way system is used for teleconferencing, and for physician and staff educational programming.

BOSTON: Harvard University's network provides television services to 12 institutions in Boston and Cambridge. Among these are six teaching hospitals, and Harvard's health professional schools.

HOUSTON: The University of Texas Health Science Center operates a network. Health Science Center operates a network serving 26 locations in the Houston area. The system serves 15 major hospitals and a variety of health education institutions located near those hospitals.

NEW HAMPSHIRE & VERMONT: The Interact Network, based at Dartmouth College, provides two-way programming for medical and professional staffs at six hospitals in North Central New Hampshire and Vermont.

EXHIBIT 4 (Cont'd)

CENTRAL PENNSYLVANIA: The Pennsylvania Hospital Television Network has as a goal the establishment of a statewide interactive video/audio network which would interconnect the 280 short-term acute care hospitals in the state for educational purposes. This organization was formally incorporated in June 1982 and organizationally established by October 1982.

The system, when operational, will include programming on a broad range of consumer health concerns: aging, arthritis, cancer, child care/parenthood, dental health, diabetes, etc. Also included is an Educational Video Library which features programming for all categories of hospital management and staff. Remote teleconferencing through the American Hospital Television Network (AHTN) will also be provided.

APPLICATION B-13TITLE

Health Information Networks

TECHNOLOGY

Satellite

DESCRIPTION

This Public Service Satellite Consortium study, conducted in 1978-1979 for NASA, involving five hospitals and one management services firm, seeks to address the value of an improved telecommunications service to hospitals. Specifically, PSSC sought to determine if hospitals had "major requirements which could be aggregated and served by such networks (private)." The study did not concern itself with the cost of "providing these services or estimate when private suppliers will provide hospitals with the services at affordable prices...A desired implicit assumption is that essential services will become affordable once the hospital industry aggregates its requirements." A total of 92 separate interviews among the six institutions were conducted. It should also be noted that the study only concerned itself with external communications links, not information exchange within the institution.

PSSC, in consultation with expert advisors, developed a list of eleven external promising communication applications in hospitals. These applications became the central focus of the survey process. Based upon an analysis of the eleven central applications, eight received the highest scores and were felt to have the greatest promise: these were (1) widely accessible on-line data bases of patient records; (2) remote diagnosis for specialty areas; (3) multi-phasic health testing; (4) video teleconferencing for administrative coordination; (5) workload smoothing among multiple hospitals; (6) educational support series; (7) point of origin data collection; and (8) assessments of the quality and utilization of health care services.

PSSC states that improved external telecommunications could: (1) improve the quality of health care by making certain clinical procedures or specialized skills more readily available; (2) improve quality through access to outside educational materials for patients, staff, and physicians; and (3) potentially eliminate unnecessary duplication of facilities or personnel.

REFERENCES

Potter, J.G., "The Value of Improved Telecommunications Service to Hospitals: A Preliminary Assessment," Public Service Satellite Consortium Under NASA Contract NAS 5-23865, April 30, 1979.

Potter, J.G. et al., "Health Information Networks: A Coming Trend?" Hospitals, January 1, 1981, pp. 65-68.

CONTACT

Public Service Satellite Consortium
Suite 907
1660 L Street, N.W.
Washington, D.C. 20036
(202) 331-1154

APPLICATION B-14TITLE

Telephone Health Information System

TECHNOLOGY

Telephone

DESCRIPTION

In January 1977, Tel-Med, a nationally franchised health-information system that provides medically-certified health information on a variety of topics to telephone users, was activated in Winston-Salem, North Carolina. The Tel-Med system was sponsored by the County Medical Society and the Chamber of Commerce. As of December 31, 1979, 343,000 calls had been recorded, an average of 10,000 calls per month.

Sponsors stated as basic Tel-Med objectives: (1) to increase accessibility to standardized, medically-certified and easily understood health information at no cost to the user on a 24 hour/day - 7 day/week service; (2) to combat rising health care costs by reducing unnecessary visits to physicians for standardized medical information; (3) to facilitate access to health services for all citizens where there is a definite medical need; (4) to help persons recognize early signs of illness; and (5) to help persons find appropriate community resources to deal with their medical problems.

In order to assess the use and effectiveness of the Tel-Med system two surveys were conducted. The first was a mail survey of all active physicians and dentists who were members of the County Medical and Dental Societies; this survey was designed to assess their knowledge of Tel-Med; their use of Tel-Med in the practice setting, and their opinion of its potential value in practice. Eighty-five per cent of the eligible physicians and 90 per cent of the dentists responded.

The second survey, designed to obtain a sample of 500 Tel-Med users involved a simple random sample of households selected from the telephone directory with an additional smaller sample of randomly generated telephone numbers. The final sample consisted of 3,005 usable responses; a total of 3,350 active telephone numbers were contacted.

RESULTS

Among the physicians and dentists surveyed, approximately 93 percent of the physicians and 82 percent of the dentists surveyed were already aware of Tel-Med. Forty-one percent of the physicians had recommended Tel-Med to their patients. Responses to questions eliciting opinions on Tel-Med's

potential showed that:

- o 57% of the physicians and 66% of the dentists strongly agreed or agreed that Tel-Med could save their time on going routine medical information.
- o 72% and 80% (of the physicians and dentists respectively) strongly agreed or agreed that Tel-Med could supplement information given patient during office visits.
- o 75% and 83% felt that Tel-Med could prepare patients to ask more pertinent questions during an office visit.

The telephone survey of the general public (N=3,005) revealed, although the findings may be slightly biased due to general population and survey population differences, that:

- o the poor and less-educated were less aware of Tel-Med than the "more fortunate counterparts."
- o education and income were not significantly related to use.
- o over 80 per cent of the users called Tel-Med more than once.
- o among the adult respondents 59 per cent felt the information given encouraged them to seek medical/dental care
- o most users (83 per cent) gave the service an overall "very useful" rating.

Diseker states that the findings suggested that Tel-Med "may be a valuable and inexpensive means of improving access to health information."

Exhibit 5, obtained from Memorial Hospital of Glendale (Glendale, California), is representative of the tape-recorded topics available from Tel-Med.

REFERENCES

Diseker, R.A., "Use and Reported Effectiveness of Tel-Med: A Telephone Health Information System," Am J Public Health, March 1980, pp. 229-231.

Diseker, R.A. et al., "An Assessment of Tel-Med Utilization by Physicians and Dentists," Am J Public Health, October 1981, pp. 1168-1170.

Information obtained from Memorial Hospital of Glendale

RELATED ARTICLES

Gordon, J.A. "The Value of Tel-Med," OH, November-December 1980, p. 23.

Reece, J. "Detroit's tel-med service one of most popular," Mich Med, July 1979, p. 398.

Davis, E., "Tel-Med," MD State Med J., August 1980, pp. 44-6.

CONTACT

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Winston-Salem, NC 27103

Steven Packwood
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Glendale, CA 91204

EXAMPLE OF TEL-MED TOPICS

429 What Is Tel-Med?

ALCOHOL PROBLEMS

- 942 Alcoholism—The Scope Of The Problem
 943 Is Drinking A Problem?
 946 So You Love An Alcoholic

ARTHRITIS—RHEUMATISM

- 126 Gout
 127 Arthritis—Rheumatism
 128 Rheumatoid Arthritis
 129 Bursitis
 131 Arthritis And Quackery

BIRTH CONTROL

- 1 Vasectomy
 53 Tubal Ligation
 54 Birth Control
 55 The Pill
 56 Intrauterine Devices
 58 Diaphragm, Foam and Condom

CANCER

- 6 Breast Cancer
 176 Cancer Of The Prostate Gland
 178 Rehabilitation Of The Breast Cancer Patient
 179 Lung Cancer
 180 Cancer Of The Colon And Rectum
 183 Cancer—Seven Warning Signals
 184 Hodgkin's Disease
 186 Cancer Of The Skin
 188 Uterine Cancer
 187 Drugs That Treat Cancer
 189 Childhood Cancers
 192 Leukemia
 520 Cancer Of The Bone
 521 Cancer Of The Bladder
 522 Cancer Of The Brain
 523 Cancer Of The Larynx
 524 Cancer Of The Mouth
 525 Cancer Of The Stomach

CHILDREN

- 10 Poisons In The Home
 73 Earache In Children
 75 Pinworms
 200 Normal Feet In Children
 220 Urining In Children
 224 Mumps
 225 Croup
 227 Measles
 229 Chickenpox
 231 Hearing Loss In Children
 236 Cystic Fibrosis
 237 Whooping Cough
 238 Meningitis
 282 Sudden Infant Death
 400 Tommy Gets His Tonsils Out
 471 Children's Vision
 5001 Recognizing Developmental Disabilities

DENTAL HEALTH

- 302 Effective Toothbrushing
 306 Malocclusion—Crooked Teeth
 308 What About Wisdom Teeth?
 309 Canker Sores And Fever Blisters
 310 How Important Are Baby Teeth?
 313 Dentures

DIABETES

- 11 You May Have Diabetes And Not Know It
 22 Foot Care For Diabetics And Others With Poor Circulation
 233 Diabetes In Children
 608 Answers To Questions Often Asked About Diabetic Diets

DIGESTIVE SYSTEM

- 2 What Is A Normal Bowel?
 4 Hemorrhoids
 44 Ulcers
 46 Indigestion
 78 Appendicitis
 196 Peptic Ulcers
 199 Colitis And Bowel Disorders
 219 Laxatives
 630 Diarrhea
 631 Gall Bladder Trouble
 662 Diverticulosis—Diverticulitis

DRUGS

- 134 LSD
 136 Amphetamines And Barbiturates (Up And Down Drugs)
 137 Marijuana
 138 Narcotics
 140 How Safe Are Drugs?
 141 How New Drugs Are Tested
 5000 PCP—Angel Dust

EYE CARE AND HEARING

- 9 Glaucoma
 78 Otitis Media: One Cause Of Hearing Loss
 470 Seeing Spots and Floaters
 472 Cataract
 473 Facts And Fallacies About Contact Lenses
 474 Presbyopia—Do You Need Reading Glasses?

FIRST AID

- 91 Severe Bleeding
 93 Electrical Shock
 94 Shock
 98 Poisoning By Mouth
 98 Head Injuries
 99 Sprains
 101 Thermal Burns
 102 Mouth To Mouth Resuscitation (Small Children And Babies)
 105 Mouth To Mouth Resuscitation (Adults)
 107 First Aid For A Person Suspected Of Having A Heart Attack
 108 Fainting
 110 When You Find Someone Unconscious
 111 Choking
 116 Animal Bites
 121 Bee Stings

GENERAL

- 34 Anemia
 38 Understanding Headaches
 38 Hiccups
 37 Backaches
 46 What Are Viruses?
 42 I'm Just Tired, Doctor
 46 Lumps And Bumps Of Arms And Legs
 47 Leg Cramps And Aches
 61 The Meaning Of Fever
 70 Sore Throat
 77 Kidney Stones
 84 Dizziness
 124 Shingles
 125 Epilepsy
 139 Help Yourself Get Well
 174 Masturbation
 191 Varicose Veins
 193 Baldness And Falling Hair
 196 Hatal Hernia
 585 Hypoglycemia
 825 Multiple Sclerosis
 1140 Blood In The Urine
 1141 Kidney And Urinary Tract Infections
 5002 Thyroid Conditions

HEART

- 21 Cigarettes And Heart Disease
 23 Diet And Heart Disease
 25 Hypertension And Blood Pressure
 26 Stroke And Apoplexy
 28 How To Decrease Risk Of Heart Attack
 29 Atherosclerosis And High Blood Pressure
 63 Early Warning Of Heart Attack
 66 Chest Pains
 72 Heart Failure

MEN

- 175 Fears Of The After-Forty Man
 176 Cancer Of The Prostate Gland
 1050 Male Sexual Response

MENTAL HEALTH

- 432 Upset Emotionally? Help Is Available
 726 Psychosomatic Illness—It's Not All In Your Head
 727 Schizophrenia
 728 When Should I See A Psychiatrist
 1180 Homosexuality

NUTRITION

- 463 The Young Child's Eating And Meats—Pleasure Or Problem?
 606 Cholesterol In Your Diet
 601 Low Salt Diet
 604 A Guide To Good Eating
 606 Nutrition In Pregnancy
 606 Snacks

PARENTS

- 90 Teen Years—Age Of Rebellion
 133 Advice For Parents Of Teenagers
 467 The Man In Your Young Child's Life
 408 Discipline And Punishment—Where Do You Stand?

PHYSICAL FITNESS

- 122 Sleep Is Kind
 1062 Sports Tips For Youngsters
 1063 Little League Elbow
 1101 Exercising—Warm Up Slowly

PLASTIC SURGERY

- 1030 Cosmetic Surgery Of The Breasts
 1034 What Is Plastic Surgery

PREGNANCY

- 8 Early Prenatal Care
 12 Am I Pregnant?
 24 Abortion
 66 What Causes Miscarriages?
 67 Warning Signs In Pregnancy
 68 Infertility
 681 Breast Feeding Your Baby
 683 Caring For Yourself After A Baby

PUBLIC HEALTH

- 52 Uce—Public, Head And Body
 162 Hepatitis
 988 Infectious Mononucleosis
 1066 What To Do During A Smog Alert

RESPIRATORY

- 7 What A Case Of Pneumonia Means
 13 Pulmonary Emphysema
 36 Influenza
 90 Hay Fever
 576 Bronchial Asthma
 581 Chronic Cough
 582 Shortness Of Breath

SKIN DISORDERS

- 79 Dandruff
 80 Ringworm
 82 Why The Mystery About Psoriasis?
 172 Acne
 516 Itching Skin

SMOKING

- 663 Weight Control While Quitting Smoking
 666 How Smoking Affects Your Health
 669 Gimmicks To Help You Quit Smoking

VENEREAL DISEASE

- 8 Venereal Disease
 15 Syphilis
 16 Gonorrhea
 570 Herpes—Type 2

WOMEN

- 31 Vaginitis
 38 Feminine Hygiene
 74 Why A "D & C"?
 173 Menopause
 182 What Is A Pap Test?
 684 Menstruation
 686 Hysterectomy
 688 Female Sexual Response

APPLICATION B-15TITLE

Interactive Patient Education

TECHNOLOGY

Microelectronics (Computer)

DESCRIPTION

In light of the recent experience of patient education programs, four areas of potential benefit are cited:

- o reduction in length-of-stay
- o reduction in use of emergency facilities by diabetes mellitus patients
- o reduction in hospitalization of cardiac patients
- o reduction in mortality rate of post infarction patients

This positive data combined with personnel constraints led the Albany Veterans Medical Center to explore alternate methods of providing patient instruction and education on their illnesses.

The approach selected was one of developing computer programs for patient teaching. To ensure patient involvement the teaching programs were designed to be interactive. Patients control the flow of educational material which cover a wide range of cardiac-related topics (e.g., post-myocardial infarction instruction, hypertensive patient education, pacemaker-patient instruction, cardiac rehabilitation, cardiac medications, post-cardiac surgery instruction, and education of patients with congestive heart failure. The patient teaching program was not intended to replace personal interaction (i.e., nurse education program), but to serve as a supplemental source of educational material.

Pre and post educational tests were administered; results of the tests indicated a 17% test score improvement following computer instruction.

REFERENCE

Lyons, C., et al., "Interactive Computerized Patient Education," Heart and Lung, July-August 1982, pp. 340-1.

CONTACT

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Medical Center
Albany, NY 12208

APPLICATION B-16TITLE

Hospital Patient Education Program

TECHNOLOGY

Microelectronics (Computer)

DESCRIPTION

The Little Company of Mary Hospital in Evergreen Park, Illinois, in 1978 instituted an in-house patient education program that utilizes the hospital data processing system; one that incorporates the use of computer terminals at each nursing unit.

The computer system requires two entries for each patient: first is a nursing assessment which involves the staff nurse entering their patient's physical ability and desire to receive formal instruction; second is attendance recording which requires that attendance information be entered for every patient following instruction. Daily and monthly summaries are produced; the daily summary allows for timely corrective measures.

The initial hospital patient education program focuses upon the identification of three groups of inpatients: (1) those who were preoperative patients; (2) those with a diagnosis of myocardial infarction; and (3) those patients eligible for the diabetic program.

Each of the above patient groups became eligible for the specific patient education regimen within the hospital setting. The Pre-op program is designed for group instruction of all surgical patients who are ambulatory or who can use a wheelchair. The Cardiac program covers five separate topics and is designed for individualized instruction; instruction is one-to-one by appointment. The Diabetic program is designed for group instruction and covers five separate topics.

REFERENCE

Murphy, J., et al., "Hospital harnesses computers' capabilities to spot solve problems in patient education programs," Promoting Health, November - December 1980, pp. 2-3.

Reilly, D., "A Computerized Patient Information System," Nursing Management, August 1982, pp. 32-36.

Hartizan, E.G., Brown, J., "Computers," Nursing Management, August 1982, pp. 29-31.

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C. ENERGY MANAGEMENT AND CONTROL

ENERGY MANAGEMENT AND CONTROL

Eliminating energy waste and controlling energy consumption have become overriding goals of the facility administrator. Since the mid-seventies, efforts to inform the health community of (a) the impact of energy shortfalls and escalating prices and (b) energy conservation techniques have been well documented and publicized within the public and private sectors. Two such references are included in this section.

Energy management and control systems can be categorized by the level of human vs. technological interaction required. The first reference discusses applications which tend to be automated and require minimal human involvement during the system operation; the second typifies applications which emphasize human involvement in the energy control function.

Automated applications are primarily those that utilize microprocessor-based control technology. As noted in the abstract which follows, examples of microprocessor-based energy control applications are contained in a publication prepared by the Energy Task Force of the Association of Physical Plant Administrators of Universities and Colleges.¹ Microprocessor-based systems reviewed in the document range from single-function control systems (e.g., temperature set-back/set-up controls) to central building systems which can monitor and control multiple energy-related functions.

Microprocessor-based systems, depending upon their configuration, have the ability to regulate the level of human involvement; they can be programmed to automatically control energy-consuming systems or perform a monitoring function which emphasizes human involvement. The tendency appears to utilize the microprocessor system primarily as a remote controller.

¹ _____, "Controlling Energy Through Microprocessor Utilization," Association of Physical Plant Administrators of Universities and Colleges, 1980.

In contrast to the above, recent telecommunication-based systems have been designed whose function is to link preprogrammed energy monitoring devices to existing in-house telephone lines. The second abstract illustrates an application in which hospital personnel monitor energy usage and consumption from a central communications console. This form of application emphasizes human involvement as system monitors with hospital personnel triggering appropriate energy-related decisions.

APPLICATION C-1TITLE

Energy Management Through Microprocessor Controls

TECHNOLOGY

Microelectronics (Computer)

DESCRIPTION

This publication, prepared under the auspices of the Energy Task Force - Association of Physical Plant Administrators of Universities and Colleges, is designed to assist the administrator in understanding the functions of microprocessor-based energy management systems. The Introduction states that the basic information presented can be used by any "administrator, architect, or engineer to develop an energy management or energy conservation program."

Chapters in the publication, designed as a workbook, present the reader with a broad overview and understanding of microprocessor-based systems in energy management. For example, areas addressed include: system planning, system design and types of control systems, sources and costs, purchasing procedures.

The publication includes appendices that present lists of major suppliers of energy management systems (courtesy of Energy Use News, 7 E. 12th Street, New York, NY 10003) and microprocessor suppliers. No attempt is made to recommend either systems or suppliers.

Although this publication is aimed at physical plant administrators in a university and college setting, the information, process, and application of principles are both appropriate and relevant to individuals with similar responsibilities in the health care delivery setting.

REFERENCES

_____, "Controlling Energy Through Microprocessor Utilization," Association of Physical Plant Administrators of Universities and Colleges - Energy Task Force, 1980.

Khosla, N.K., "Systems for energy control management," Hospitals, October 16, 1980, pp. 109-118.

RELATED ARTICLE

Reynolds, M., "Microprocessor techniques in energy conservation," Hosp Eng, December 1980, pp. 15-17.

CONTACT

Christopher Crittenden
Director, Energy Task Force
Association of Physical Plant Administrators

APPLICATION C-2TITLE

Energy Management Control Systems

TECHNOLOGY

Telephone

DESCRIPTION

Spiraling energy costs have forced hospital managers to closely examine and monitor energy consumption in their facility in order to better understand and control energy costs. Community General Osteopathic Hospital in Harrisburg, PA, has installed the Dimension 200 PBX system, designed to support in-house telecommunications and energy management by eliminating the necessity of installing an alternate energy management system which could require extensive additional wiring to link energy devices to a central controller. Existing in-house telephone lines were utilized.

An energy communications console was installed and became the control center from which personnel can modify energy usage within the hospital. Various parameters are programmed into the system which enable the facility to monitor facility utilization and energy consumption thus allowing corrective action to be taken to facilitate energy efficiency. For example, power can be shut off or reduced when a facility is not in use; facilities that must maintain certain levels of functioning yet not require full power can be adjusted through cycling, and energy components such as compressors, generators, lights, etc., can be monitored and controlled.

REFERENCES

Strohl, G.R., "Phone System Cuts Energy Use, Emergency Response Time," Osteopathic Hospitals, September 1981, p. 23. ,

"Hospital PBX system also handles energy management," Comms N, September 1980.

Lunde, B., "New dimensions in hospital management (Bell System energy system)," Telephony, June 1981.

CONTACT

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APPENDIX
ANNOTATED BIBLIOGRAPHY

TELECOMMUNICATIONS AND MICROELECTRONICS IN HEALTH CARE DELIVERY:
AN ANNOTATED BIBLIOGRAPHY

This bibliography is a compilation of articles and reports which describe the growing application of two major technologies -- telecommunications and microelectronics -- to the delivery and administration of health care. Primary emphasis is placed on those applications whose title or content indicate a real potential for favorable impact on energy consumption.

Not all of the references cited have been reviewed; those for which copies could not be obtained or which were otherwise not explicitly reviewed are indicated by an asterisk. Articles and reports which were reviewed and confirmed to be of interest from an energy standpoint are highlighted as follows:

- (a) Those which apply to a particular application have by and large been cited and discussed in the project abstracts which form the body of this document. Where this is the case, the applicable application number appears in brackets immediately following the citation (e.g., [A-1], [B-2], etc.).
- (b) Those which are of broad general interest but do not relate to a specific recent application are briefly annotated directly within the bibliography.

The material in this bibliography is presented in two major sections:

A. Telecommunications

B. Microelectronics

References which contain elements of both technologies are generally classified under Telecommunications so long as they include a significant telecommunications component. References which clearly belong under one or the other of the two major headings but which fit no particular subclassification or whose classification is unknown have been placed in the "General Interest (Unclassified)" category.

References within each of the major sections are organized as follows:

	<u>No. of Citations</u>	<u>Pages on Which Found</u>
A. <u>Telecommunications</u>		
1. <u>Telemedicine</u>		
a. Satellite-based	3	A-1
b. Television-based	13	A-1,2
c. Telephone-based	10	A-2,3
d. General other, or unknown	8	A-3,4
2. <u>Teleradiology</u>	6	A-5
3. <u>Other</u>	2	A-6
4. <u>Telecommunications As an Aid in Health Education</u>	31	A-7,8,9
5. <u>General Interest (Unclassified)</u>	9	A-10
Total	82	
B. <u>Microelectronics</u>		
1. <u>Medical Applications</u>		
a. Aids in diagnosis	8	B-1
b. Hypertension management	2	B-1
c. Intensive care	5	B-2
d. General patient management	3	B-2
e. Other or unknown	6	B-2,3
2. <u>Administrative Applications</u>		
a. Dietary	5	B-4
b. Registration and appointments	4	B-4,5
c. Pharmacy	2	B-5
d. Operating room	1	B-5
e. Laboratory	4	B-6
f. Medical records	4	B-6
g. Other or unknown	18	B-6,7,8
3. <u>Energy Management/Conservation</u>	26	B-9,10
4. <u>General Interest (Unclassified)</u>	13	B-11
Total	101	

The pages which follow contain a glossary of the abbreviations used, both in the bibliography and in the main body of the report, for identifying periodicals and journals.

GLOSSARY OF ABBREVIATIONS

A

Adm Mgt
Air Cond Heat and Refrig

Am J Med
Am J Nursing
Am J Obstet Gynecol

Am J Public Health
Anaesth Intensive Care
Ann Otol Rhinol Laryngol

Annu Rev Biophys

AORN J
Arch Intern Med
Arch Pathol Lab Med

Administrative Management
Air Conditioning, Heating and
Refrigeration News
American Journal of Medicine
American Journal of Nursing
American Journal of Obstetrics
and Gynecology
American Journal of Public Health
Anaesthesia and Intensive Care
Annals of Otology, Rhinology
and Laryngology
Annual Review of Biophysics
and Bioengineering
Supersedes OR Nursing
Archives of Internal Medicine
Archives of Pathology and
Laboratory Medicine

B

Bldg Syst Design
Br Med J
Bull Am Protestant Hosp Assoc

Building Systems Design
British Medical Journal
Bulletin American Protestant
Hospital Association

C

Can Med Assoc J

Clin Chem
Clin Lab Haematol
Clin Perinatol
Comms N
Comput Hospital
Comput Programs Biomed
CRC Crit Rev Bioeng
Crit Care Med

Canadian Medical Association
Journal
Clinical Chemistry
Clinical and Laboratory Haematology
Clinics in Perinatology
Communications News
Computers in Hospitals
Computer Programs in Biomedicine
CRC Critical Reviews in Bioengineering
Critical Care Medicine

D

Dimens Health Serv

Dimensions in Health Service

E

Educ Ind Telev
Emerg Dep News
Eng N

Educational and Industrial Television
Emergency Department News
Engineering News-Record

F

Food Manage
Forum Med

Food Management
Forum Medicine

H

Health Soc Serv J
Heart Lung
Hosp Eng
Hosp Fin Mgt
Hosp Forum
Hosp Health Serv Rev
Hosp Pharm Manage
Hosp Top

Health and Social Services Journal
Heart and Lung
Hospital Engineering
Hospital Financial Management
Hospital Forum
Hospital and Health Services Review
Hospital Pharmacy Management
Hospital Topics

I

Int J Biomed Comput

International Journal of Bio-Medical
Computing

J

J R Coll Gen Pract
J R Soc Med
J Am Diet Assoc
J Clin Comput
J Contin Educ Nurs
J Fam Pract
J Long Term Care Adm
J Med Assoc State Ala
J Med Eng Tech
J Med Syst
JAMA
JEMS
JNE

Journal of the Royal College of
General Practitioners
Journal of the Royal Society of
Medicine
Journal of the American Dietetic
Association
Journal of Clinical Computing
Journal of Continuing Education
in Nursing
Journal of Family Practice
Journal of Long Term Care
Administration
Journal of the Medical Association
of the State of Alabama
Journal of Medical Engineering
and Technology
Journal of Medical Systems
Journal of the American Medical
Association
Journal of Emergency Medical
Services
Journal of Nursing Education

M

Med Care
Med Electron
Med Inf (Lond)
Med Instrum
Med Lab
Med Mark Media
Methods Inf Med
Md State J
Mich Hosp
Mich Med
Milit Med
Mod Health Care

Medical Care
Medical Electronics
Medicine et Informatique
Medical Instrumentation
Medical Laboratory
Medical Marketing and Media
Methods of Information in Medicine
Maryland State Medical Journal
Michigan Hospitals
Michigan Medicine
Military Medicine
Modern Health Care

O

OH

Osteopathic Hospitals

P

Promot Health
Public Health Rep
Public Relat J
Purch Adm

Promoting Health
Public Health Reports
Public Relations Journal
Purchasing Administration

R

R Soc Health J
Radiol Manage
Rev Inst Hyg Mines (Hasselt)

Royal Society of Health Journal
Radiology Management
Revue De L' Institut D' Hygiene
Des Mines (Hasselt)

S

South Hosp
Specif Eng

Southern Hospitals
Specifying Engineer

T

Telecomms
Todays Nurs Home

Telecommunications
Todays Nursing Home